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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET
ATLANTA, GEORGIA 30365

TVA/PUB--87/7

DE87 900334

The enclosed "Report of Review Panel Activities, United States v. Olin Corporation Consent Decree, May 31, 1983 - June 30, 1986" reflects the significant progress made to date in resolving a complex environmental problem. Just over three years ago the Consent Decree in United States v. Olin Corporation was approved and a Review Panel was established to oversee the implementation of the Decree. Since that time, representatives from the Environmental Protection Agency, Tennessee Valley Authority, Fish and Wildlife Service, Department of the Army, and State of Alabama, together with representatives from the Town of Triana, Alabama, and Olin Corporation have demonstrated that government - federal, state, and local - can work with industry and achieve major environmental results.

I am confident that subsequent Annual Reports will reflect continuing progress.

Sincerely,

Howard Zeller

HOWARD D. ZELLER
Chairman, Review Panel

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REPORT ON THE REMEDIAL ACTION TO ISOLATE DDT FROM PEOPLE AND THE ENVIRONMENT IN THE HUNTSVILLE SPRING BRANCH-INDIAN CREEK SYSTEM, WHEELER RESERVOIR, ALABAMA:

REVIEW PANEL ACTIVITIES, (*UNITED STATES v. OLIN CORPORATION* CONSENT DECREE), MAY 31, 1983-JUNE 30, 1986

Environmental Protection Agency, Region IV
Atlanta, Georgia

July 1986

MASTER

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Acknowledgements

The accomplishments of the Review Panel over the past three years have been made possible by the combined efforts of the members of the Review Panel and staffs of the involved organizations. The Review Panel specifically recognizes Anne L. Asbell, Associate Regional Counsel, EPA, Atlanta, for her advice and counsel, assistance, and dedication over the past three years. In addition, the following people deserve special acknowledgement: Arthur G. Linton, Robert B. Howard Patricia A. Brooks, and Wayne I. Garfinkel, EPA; Morris W. (Bill) Schroder, Redstone Arsenal; E. John Williford, ADEM; Drs. Lee A. Barclay and Donald P. Schultz, and William E. (Ed) Organ, FWS; Walter W. La Roche and John R. Thurman, TVA; William L. James and Ray D. Hedrick, Nashville COE; R. W. (Bob) Hyland and Keith D. Roberts, Olin Corporation.

REVIEW PANEL ACTIVITIES REPORT

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REVIEW PANEL ACTIVITIES REPORT

EXECUTIVE SUMMARY

On May 31, 1983, the United States District Court for the Northern District of Alabama (Northeastern Division--the Honorable Robert B. Propst presiding) entered, as part of an overall order settling litigation between the United States of America, the State of Alabama, and four sets of private parties against the Olin Corporation, a Consent Decree that governs the development and implementation of remedial action for the DDT contamination in the Huntsville Spring Branch-Indian Creek (HSB-IC) System. The Consent Decree requires the Olin Corporation to develop and implement a remedial plan that will meet a performance standard of 5 parts per million (ppm) of DDT[1] in fillets of channel catfish, largemouth bass, and smallmouth buffalo in specified reaches of the HSB-IC System. This performance standard is to be achieved by a remedy that is consistent with the goals and objectives of the Consent Decree.

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1. For purposes of the Consent Decree and as used in this report, DDT is defined as: 1,1,1-trichloro-2,2-bis- (p-chlorophenyl) ethane, including its isomers, and the degradation products and metabolites DDD or TDE (1,1-dichloro-2,2-bis (p-chlorophenyl) ethane), and DDE (1,1-dichloro-2,2-bis (p-chlorophenyl ethylene), and the isomers thereof.

A Review Panel, consisting of members from the United States Environmental Protection Agency (EPA), Tennessee Valley Authority (TVA), United States Fish and Wildlife Service (FWS), the Department of the Army (DA), the State of Alabama (ADEM), and nonvoting participants from the town of Triana, Alabama (Triana), and the Olin Corporation (Olin), was established by the Consent Decree. Review Panel responsibilities include technical overview and approval of Olin's proposals to achieve the requirements of the Consent Decree.

This report summarizes the activities of the Review Panel associated with implementation of Consent Decree requirements from May 31, 1983 through June 30, 1986. In addition to representation on the Review Panel, several of the agencies had responsibilities for issuing permits, licenses and certifications related to the remedial action implementation. Therefore, these activities are also briefly discussed.

Following the establishment of the Review Panel in June 1983, Olin submitted its proposed remedial plan on June 1, 1984 as required by the Consent Decree. The Review Panel held a public hearing on July 14, 1984 in Triana to provide information to the public and receive comments on the proposal.

After thorough review and evaluation by the Review Panel member agencies, the Review Panel accepted the Olin proposal, with modifications, and issued its decision on August 31, 1984. Subsequently, Olin proceeded with the development of the engineering plans and technical specifications and applications for the necessary permits to carry out the remedial activity. Permits from the United States Army Corps of Engineers, the TVA, and the FWS were required. The Nashville District Corps of Engineers (Nashville COE) proceeded with the development of an Environmental Impact Statement (EIS), with EPA, TVA, and FWS, as cooperating agencies. The final EIS was completed in February 1986, and following the comment period, the permitting agencies issued records of decision and the necessary permits on March 31, 1986 and April 1, 1986. ADEM was a participating agency in the EIS process and issued the State certification required for the Federal permits and licenses. The Redstone Arsenal license for Olin activities within the Arsenal boundaries had been issued in December 1985. In January 1986, the FWS had authorized Olin to begin preliminary mobilization activities. After receipt of the required permits and licenses full construction of the remedy began in April 1986. An official groundbreaking ceremony was held on April 23, 1986 with Review Panel members and Review Panel-represented agencies participating in the ceremony.

In addition to the development and implementation of an environmental remedy, the Consent Decree required Olin to conduct comprehensive studies of fish, water, sediment, and sediment transport to establish baseline conditions which could be used to evaluate the effectiveness of the remedy. Interim goals to indicate progress toward attainment of the performance standard are also a requirement, as is designation of substitute fish species and a long-term monitoring program. Olin has completed the baseline studies and submitted comprehensive reports detailing the analytical data. Proposals and recommendations for the interim goals and substitute fish species and the long-term monitoring program have also been submitted to the Review Panel.

On August 1, 1985, Olin submitted a report outlining several alternate approaches for actions that may be appropriate in the area between HSM mile 4.0 and 2.4, known as lower Reach A. In October 1986, Olin will submit to the Review Panel a plan for implementation of remedial action in this area.

The Review Panel, in cooperation with Olin, will continue its efforts to ensure implementation of the provisions of the Consent Decree. Thereafter, the activities of the Review Panel will be summarized annually.

REVIEW PANEL ACTIVITIES REPORT

I. INTRODUCTION

On May 31, 1983 the United States District Court for the Northern District of Alabama (Northeastern Division--the Honorable Robert B. Propst presiding) entered, as part of an overall order settling litigation between the United States of America, the State of Alabama, and four sets of private parties against the Olin Corporation, a Consent Decree that governs the development and implementation of remedial action for DDT contamination in the HSB-IC System. A copy of the Consent Decree is included in Appendix A.

The Consent Decree requires the Olin Corporation to develop and implement a remedial plan that will meet a performance standard of 5 parts per million (ppm) of DDT[1] in fillets of channel catfish, largemouth bass, and smallmouth buffalo in specified reaches of the HSB-IC System. Those reaches are:

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[1] For purposes of the Consent Decree and as used in this report, DDT is defined as: 1,1,1-trichloro-2, 2-bis- (p-chlorophenyl) ethane, including its isomers, and the degradation products and metabolites DDD or TDE (1,1-dichloro-2,2-bis (p-chlorophenyl) ethane), and DDE (1,1-dichloro-2,2-bis (p-chlorophenyl ethylene), and the isomers thereof.

A - HSB mile 5.4 to 2.4
B - HSB mile 2.4 to 0.0
C - IC mile 5.6 to 0.0

A map identifying the location of these reaches is shown in Figure 1.

The purpose of the remedy, monitoring and other action which Olin is required to perform under the Consent Decree is to isolate DDT in the HSB-IC System from people and the environment and to minimize transport of DDT out of the HSB-IC System to protect human health and the environment. The performance standard is to be achieved by a remedy consistent with the goals and objectives of the Consent Decree which are:

(a) Isolate DDT from people and the environment in order to prevent further exposure;

(b) Minimize further transport of DDT out of the HSB-IC system;

(c) Minimize adverse environmental impacts of remedial actions;

(d) Mitigate effect of DDT on wildlife habitats in the Wheeler National Wildlife Refuge (WNWR);

(e) Minimize adverse effects on operations at Redstone Arsenal (RSA), Wheeler Reservoir, and WNWR;

(f) No increase in flooding, particularly at the City of Huntsville and RSA, except those increases in water level which can be reasonably expected in connection with the implementation of remedial action, provided the Olin Corporation takes all reasonable steps to minimize or prevent such increases; and

(g) Minimize effect of loss of storage capacity for power generation, in accordance with the TVA Act.

A. REVIEW PANEL

The Consent Decree provided for Federal oversight of the remedial activities through the establishment of a Review Panel, chaired by the Environmental Protection Agency and consisting of representatives from Environmental Protection Agency (EPA), Tennessee Valley Authority (TVA), United States Fish and Wildlife Service (FWS), the Department of the Army (DA), the State of Alabama (ADEM), and nonvoting participants from Triana, Alabama (Triana), and the Olin Corporation (Olin).

The Review Panel responsibilities include review of data and taking action on the proposal for remedial action(s), interim goals, substitute species, long-term monitoring program and other appropriate matters to ensure implementation of the Consent Decree. The Review Panel has the responsibility for the approval or disapproval of the proposed remedy. If, during or following implementation of the remedy, the Review Panel determines that modifications are necessary to meet the 5 ppm performance standard established in the Consent Decree, the Review Panel may require such modifications.

The Consent Decree required the submission of the initial proposed remedial action plan from Olin by June 1, 1984, and action by the Review Panel to accept, reject, or designate a substitute remedy by September 1, 1984. Olin's proposed remedial action plan was submitted to the Review Panel on June 1, 1984, as required by the Consent Decree. Following internal agency meetings, six Review Panel meetings and a public hearing during the period of June 1, 1984 through August 31, 1984, the Review Panel accepted the Olin remedial plan, with modifications, terms and conditions. The Review Panel issued its Decision Document on August 31, 1984 (Appendix E).

Since August 31, 1984, Olin has continued its studies directed toward the establishment of baseline data and the development of the interim goals and substitute species proposals. In addition, the major efforts of Olin, the Review Panel, and the Review Panel-represented agencies were directed to the development of detailed engineering plans and specifications, environmental reviews, and permitting actions associated with implementation of the remedial action. The Nashville COE and the TVA permits for the remedial action were issued on March 31, 1986, and the FWS permit was issued on April 1, 1986. Construction was begun on April 1, 1986. An official groundbreaking ceremony was held on April 23, 1986 with Review Panel members and Review Panel-represented agencies participating in the ceremony. A remedial action map and photographs of the groundbreaking ceremony and construction activities are shown in Figures 2, 3, and 4 respectively.

B. HISTORIC BACKGROUND

Wastewater discharged from a DDT manufacturing plant operated between 1947 and 1970 at Redstone Arsenal (RSA), Alabama, has resulted in extensive DDT contamination in Huntsville Spring Branch

(HSB) and Indian Creek (IC). The plant was operated under lease from RSA by Olin for most of this period. The most recent estimate of the extent of DDT contamination in stream sediments is 417 tons, of which at least 94 percent is between HSB miles 2.4 and 5.57.

As a result of this DDT discharge, some fish and other wildlife in the HSB-IC vicinity have become heavily contaminated with DDT. Concentrations of DDT in fillets of fish species collected from HSB and IC have exceeded the 5.0 part per million (ppm) action level informally established by the Food and Drug Administration (FDA, 1981). DDT content of channel catfish fillets frequently exceeded 100 ppm, while levels in some other species were generally lower. Studies of sediment and DDT transport in the HSB-IC system have determined that DDT is being transported downstream at a sufficiently high rate to indicate that the existing contamination may become more widespread. A wide range of DDT concentrations has been observed in blood samples from residents living near the contaminated streambed. Centers for Disease Control (CDC) researchers studying these residents were not able to correlate DDT levels in the blood with any adverse health effects and long-term effects of DDT contamination in humans have not been demonstrated.

II. PURPOSE AND SCOPE

The purpose of this report is to summarize the activities of the Review Panel associated with implementation of the Consent Decree requirements from May 31, 1983 through June 30, 1986. This report is intended as information for the interested public and Review Panel agencies. This initial report includes basic background documents and references. The Review Panel intends to issue updated reports annually. Each report will discuss ongoing and completed activities of the Review Panel for the period and will frame the agenda for the following year.

Primary activities of the Review Panel during the report period include the following:

(1) Development of Review Panel operating procedures,

(2) Review and approval of Olin's remedial action proposal,

(3) Issuance of the Decision Document, August 31, 1984,

(4) Receipt and evaluation of:

  (a) quarterly reports submitted from September 1, 1983 through March 1, 1986,

  (b) baseline data conditions from which to measure performance,

    (c) substitute fish species alternatives,
    (d) interim goals, and
    (e) long-term monitoring program.

(5) Oversight of monitoring and remedial activities to ensure implementation of the provisions of the Consent Decree.

The responsibilities of the Review Panel represented agencies also include certification, permitting, and licensing requirements for the remedial action; therefore, these activities have been identified and are briefly discussed in this report. The major activities of the individual Review Panel represented agencies include:

(1) National Environmental Policy Act reviews and compliance.

(2) Remedial action certification, permitting, and licensing requirements.

III. HIGHLIGHTS OF REVIEW PANEL ACTIVITIES

The Review Panel has held quarterly meetings and, as the need arose, specially called meetings since the initial meeting on June 14, 1983. The meetings have been held at the Redstone Arsenal, and Wheeler National Wildlife Refuge, Alabama, and the cities of Atlanta, Georgia, and Triana, Alabama. The meetings were open to the public and were announced by press releases issued by the EPA to the news media in the Huntsville and Decatur, Alabama area as well as the wire services, AP and UPI.

In August 1983, a technical committee was established by the Review Panel to meet prior to each Review Panel meeting. This committee is chaired by EPA and includes representation from TVA, the FWS, and technical staff of the other Review Panel-represented agencies and non-voting participants. The purpose of the committee is to provide a forum for the discussion of technical issues between the technical staff of the Review Panel agencies and Olin. A report of the discussions and the resolution of issues is then presented to the full Review Panel during its formal meetings. This committee has proven effective and will continue its role.

A. REVIEW PANEL

The primary function of the Review Panel is to ensure the orderly and timely implementation of the Consent Decree provisions. In carrying out its responsibilities over the past three years, the Review Panel has taken action to provide guidance and decisions on a variety of matters. Among those items were:

(1) Development of operating procedures for the conduct of its activities and responsibilities. Operating procedures were developed and adopted by the Review Panel members and nonvoting participants in January 1984. A copy of the Memorandum of Agreement-Review Panel Operating Procedures is included in Appendix C.

(2) Development of environmental assessment guidance in April 1984 for Olin's use in preparing its remedial action proposal. The guidance document was developed through the combined efforts of the Review Panel agencies.

(3) Development of public involvement procedures in April 1984 to provide the public an opportunity to receive information and comment on

the environmental issues prior to a final decision on the proposed remedial action.

(4) Review, evaluation, public hearing and final decision on the Olin remedial action proposal during the period between June 1, 1984 and August 31, 1984.

(5) Development and issuance of the Review Panel Decision Document on August 31, 1984. A copy of the document is included in Appendix E.

(6) Review, evaluation, and agreement on the final engineering plans and technical specifications for the remedial action plan.

(7) Cooperation and assistance to the environmental impact statement and permitting processes for the remedial action plan.

(8) Development of the quality assurance/quality control program for use in the collection, analysis, and interpretation of monitoring data.

Other items required by the Consent Decree that have been completed or are underway are presented below:

(1) Under the terms of the Consent Decree, Olin was required to perform a number of studies and to collect baseline data

needed for the development of an appropriate environmental remedy. Olin has conducted fish sampling and analysis; sediment sampling and analysis; water sampling and analysis; sediment transport studies; laboratory and in situ (instream) fish uptake studies; groundwater sampling and analysis; and various support studies. Such data have been used to establish baseline conditions on the amounts and distribution of DDT within the HSB-IC System, to determine DDT uptake and depuration rates in fish, and DDT transport within and through the HSB-IC System. These data will also be used to evaluate the effectiveness of the remedial action. Fish collections were conducted by Olin over a three-year period to determine DDT concentrations in performance standard (and other) fish and to determine fish species present in each reach of the HSB-IC System.

(2) Water samples during normal flow and stormflow events were collected by Olin over a three-year period to characterize

sediment transport. Extensive sediment sampling was conducted to define the quantity and distribution of DDT in the bottom sediments in each reach of the HSB-IC System. A series of DDT uptake studies were conducted to determine the pathway and rates of DDT uptake and depuration in fish. Olin also conducted groundwater studies as required by the Joint Technical Proposal to Implement Remedial Activities (Appendix B to the Consent Decree).

Data collected during the field and laboratory studies were presented to the Review Panel in quarterly reports beginning September 1, 1983. As of March 1, 1986, eleven quarterly reports have been submitted. In addition to the quarterly reports, on July 1, 1985 Olin submitted a five-volume report which detailed the results of the field and laboratory investigations of the HSB-IC System completed to date and the status of ongoing studies.

In March 1986, Olin submitted the following reports to the Review Panel for review, evaluation and approval: DDT in Fish and Water, Baseline Report; Interim Goals Report; Substitute Species Report; and Long-Term Data Acquisition Report (long-term monitoring report). The data in the DDT in Fish and Water, Baseline Report, include information on HSB-IC water, performance standard fish and potential substitute fish species which will be used to reflect baseline conditions for use in evaluating the effectiveness of the remedial action. The Review Panel has requested the submission of further information and clarification before final action is taken on the baseline report. Appropriate action will be taken on the Interim Goals, Substitute Species and Long-Term Data Acquisition Reports in the near future.

In recognition of the significance of the detailed monitoring studies performed by Olin in the HSB-IC System, the Review Panel has suggested that Olin develop a schedule for compiling the results of its fish uptake and depuration studies for the use and reference of the scientific community.

1. Remedial Action

In accordance with the requirements of the Consent Decree, Olin is to develop and implement remedy(ies) to achieve and to continue to achieve the performance standard consistent with the goals and objectives established in the Consent Decree.

On June 1, 1984 Olin submitted to the Review Panel its initial proposal for remedial action as required by the Consent Decree. This proposal included (1) monitoring results available through June 1, 1984; (2) a conceptual remedial action plan; (3) a schedule for implementation; (4) a conceptual monitoring plan; and (5) other information as required by the Consent Decree.

On July 14, 1984, after 30 days advance notice to the public through local newspaper advertisements, the Review Panel held a public hearing in the town of Triana, Alabama to provide information to the public and receive comments on Olin's remedial plan. More than 400 people attended the public hearing, 20 people registered to speak and 11 actually made statements. In addition to oral comments entered into the record, 17 written comments were received by July 28, 1984 (the date the record closed) and 9 were received after that date. All comments, oral and written, were made part of the public record and were considered by the Review Panel in its deliberations on Olin's remedial proposal.

On August 31, 1984, the Review Panel issued its Decision Document which approved Olin's remedial action proposal, with modifications. In arriving at its decision the Review Panel evaluated other alternatives and environmental effects. A copy of the Decision Document is included in Appendix E.

Olin's proposal principally involved the construction of a bypass channel to re-route the HSB between miles 5.5 and 4.0 and *in situ* burial of DDT contaminated sediments within and along the overbank of the existing HSB channel. The Consent Decree defined the stream portion between HSBM 5.4 and 2.4 as Reach A. The portion of Reach A where remedial action has been approved is known as Upper Reach A (HSBM 5.4-4.0). The remaining stream reach between HSBM 4.0 and 2.4 is known as Lower Reach A (see Figure 1).

The most significant Review Panel modification was the requirement for Olin to develop a remedial plan for the removal and/or isolation of the DDT occurring between HSB miles 4.0 and 2.4 (Lower Reach A).

The Decision Document established the schedule for Olin's submission of detailed engineering plans and specifications and permit applications to both the Review Panel and permitting agencies. The document also established the schedule for submission of a detailed long-term monitoring plan, the proposal for interim goals, and a plan for additional remedial action in Lower Reach A. In all cases, Olin has provided information and reports as appropriate in accordance with the schedule identified in the Decision Document.

In compliance with the schedule established by the Review Panel, Olin submitted permit applications and engineering plans and technical specifications to the appropriate agencies. The Nashville COE prepared an EIS. The EPA, TVA, and FWS, were cooperating agencies and ADEM was a participating agency. During the environmental review process, Olin proposed a modification to the alignment of the bypass channel which reduced the adverse environmental effects associated with the implementation of the Review Panel approved remedial action. This modification was incorporated into the final remedial action design with the concurrence of the Review Panel and the permitting agencies (see Figure 2). Additional information concerning the environmental review and permitting process are described in more detail in the section, "Related Support Activities."

The EIS process was completed on March 24, 1986 and all required approvals were issued by April 1, 1986. Olin initiated limited site mobilization activities on January 28, 1986 and implemented full construction on April 1, 1986.

Olin's schedule for completion of the remedial action was initially projected for March 1, 1988. Following completion of the environmental review and permitting process, the Review Panel, in April 1986, requested Olin to submit a revised construction schedule. On June 30, 1986, Olin submitted a revised schedule which projects a completion date of August 1, 1987. The favorable weather and construction conditions experienced through June 1986 are the primary reasons for the accelerated construction schedule.

2. Substitute Fish Species

In the event any of the three performance standard fish species cannot be obtained in any one of the reaches, the Consent Decree provides that Olin and the Review Panel shall agree upon one or more substitute fish species for that reach. Olin has submitted its proposal and recommendations on substitute species for review and action by the Review Panel. The proposal was based on the results of the baseline monitoring program including (1) fish abundance for species other then performance standard fish found in each reach; (2) the levels of DDT in the substitute fish species; and (3) the similarities of the proposed substitute species to the performance standard species. The proposal also includes the conditions upon which Olin would use the substitute species in lieu of performance standard fish species.

The proposal has been reviewed by the Review Panel and Olin has been requested to provide additional information and clarification. Upon receipt of the information, the Review Panel will complete its review and evaluation of the report and reach agreement with Olin on substitute fish species during 1986.

3. Interim Goals

The Consent Decree provides for the establishment of interim goals to evaluate Olin's progress toward attaining the performance standard. On August 1, 1985, Olin submitted its report "Huntsville Spring Branch-Indian Creek Post Remedial Action Interim Goals." Following Olin's submission of this report, the Review Panel deferred further action on interim goals until the completion of the environmental review process and permitting actions by the permitting agencies. The proposed interim goals have been reviewed and discussed by the Review Panel, but a decision was again deferred, pending receipt and evaluation of additional information and clarification of the baseline data and substitute fish species reports. Action on this item and establishment of interim goals is expected to be completed in 1986.

4. Long-Term Monitoring Program

The Consent Decree requires the establishment of a monitoring program to obtain data to evaluate the effectiveness of the remedial action. Monitoring data will also be used to determine achievement of interim goals.

The June 1, 1984 remedial action proposal submitted by Olin included a description of the long-term monitoring program. The Decision Document required the submission of a detailed monitoring plan by February 1, 1985, and Olin submitted the plan as required. The Review Panel deferred action on the proposed plan, pending receipt of the baseline data report from Olin and completion of the environmental statement process and permitting actions by the permitting agencies. Olin subsequently was requested to submit by March 1, 1986 a revised plan which included consideration of (1) results of the baseline data report; (2) the substitute fish species proposal; (3) the interim goal proposal; and (4) the status of the permitting agencies' environmental review and permit requirements. On March 1, 1986, Olin submitted the revised report, "Huntsville Spring Branch-Indian Creek Long-Term Data Acquisition Program." Further action by the Review Panel has been deferred, pending completion of Review Panel approval of the baseline data report, substitute fish species report, and the interim goals report. Review Panel action on the long-term monitoring program will be completed during 1986.

5. Technical Support for the Review Panel

During the last three years, the Review Panel has received outstanding technical support and assistance from the Review Panel members, the staffs of the Review Panel member agencies, and Olin's technical staff. In addition, the Review Panel has received technical support and assistance from Dr. James Sullivan and the staff of Water and Air Research, Inc. (WAR, Inc.) on a consultation basis.

B. RELATED SUPPORTING ACTIVITIES

The Consent Decree specifically provides that work undertaken pursuant to the Consent Decree is to be performed in accordance with all applicable Federal, State, and local statutes, regulations, ordinances, and permits. Olin is required to obtain any permits or authorizations required by applicable Federal, State, and local law in carrying out the work required of Olin by the Consent Decree.

The Review Panel-represented agencies were the agencies vested with the responsibility for the administration of most of the applicable Federal and State environmental approvals related to implementation of remedial action. Although the activities of the Review Panel members did not include administration and compliance with other environmental requirements and/or the issuance of specific permits, it was important for the Review Panel activities to be closely coordinated with activities of the permitting agencies throughout the environmental review and permitting processes. The following sections summarize these related supporting activities with respect to environmental review under the National Environmental Policy Act and issuance of certifications, permits, and licenses.

1. Environmental Impact Statement

The Olin remedial action plan approved by the Review Panel required various permits or approvals from several Federal agencies and the ADEM prior to implementation. The actions were subject to the requirements of each agencies' regulations for permitting and licensing and the National Environmental Policy Act (NEPA). The Nashville COE determined that an environmental impact statement (EIS) covering the permit action was required, and requested the participation of the EPA, TVA, and FWS as cooperating agencies for the EIS. Those agencies agreed to participate with the Nashville COE in the environmental impact statement process. The State of Alabama represented by ADEM, and the DA, represented by Redstone Arsenal, had an active role in the environmental review process. The draft EIS was issued by the Nashville COE in July 1985. Following receipt, review, and evaluation of the public comments, the final EIS was issued in February 1986. Following the conclusion of the public comment period, the permitting agencies issued their respective records of decision and permits with conditions.

The Review Panel maintained an interest and awareness of the actions underway to complete the environmental impact statement and permitting activities, and assisted the permitting agencies and Olin in the timely completion of the process.

2. Certifications, Permits, and Licenses

Olin's remedial action plan required the issuance of certifications, permits, and licenses from the following agencies:

AGENCY	ACTION REQUIRED
Alabama Department of Environmental Management	Section 401 certification under the Clean Water Act.
Department of Army	
Corps of Engineers Nashville District	Section 10 permit under the Rivers and Harbors Act,
	Section 404 permit under the Clean Water Act.
Redstone Arsenal	Licenses for Olin facilities and activities within Redstone Arsenal boundary.
US Fish and Wildlife	Right-of-Way Easement for Olin activities. Service within the boundary of Wheeler National Wildlife Refuge.
Tennessee Valley Authority	Section 26a permit under the Tennessee Valley Authority Act.

Olin made timely application and provided information to each agency to satisfy the agencies' regulations and permit issuance process. Special terms and conditions incorporated in the individual permits were coordinated between the agencies as part of the environmental review process to maintain continuity and avoid conflict between individual permits.

IV. REVIEW PANEL GOALS AND OBJECTIVES FOR THE PERIOD JULY 1, 1986 THROUGH JUNE 30, 1987

The Review Panel will continue its oversight of the implementation of the remedial action which began in April 1986. The Review Panel will complete action on the baseline data, interim goals, substitute species, long-term monitoring program and approval of the construction schedule. Upon receipt, the Olin plan for Lower Reach A will be evaluated and appropriate action, i.e., approval, rejection, or modification, will be taken by the Review Panel.

The Review Panel will continue to meet on a regular basis, but meetings will be scheduled less frequently. Quarterly reporting by Olin has been changed to semiannual reporting for submission of the data reports. The construction status reports will continue on a quarterly basis during the construction period.

A. Activities Associated with Determination of Compliance

The activities in this category to be addressed during the next year are as follows:

(1) review and approval of Olin's revised construction schedule for Upper Reach A,

(2) approval of baseline data reports for DDT in water and fish,

(3) approval of substitute fish species and the establishment of conditions when substitute fish species will be used,

(4) approval of interim goals for DDT levels in water and fish, and

(5) approval of the long-term monitoring program.

As indicated previously, considerable progress has already been made in each of these areas. Following receipt of the additional information requested from Olin, it is anticipated that each of these activities will be completed by the end of 1986. The Review Panel will continue to review and monitor Olin's construction progress in Upper Reach A.

B. Remedial Action in Lower Reach A (HSBM 4.0-2.4)

In response to the Review Panel Decision Document, Olin submitted a report on August 1, 1985 which identified several alternative approaches for action which may be appropriate and feasible in Lower Reach A (see Figure 1). Among those approaches were: sediment isolation, low level dam (at HSBM 2.4 or 2.0), sediment removal, channel rerouting, modifications to channel cross section, channel rerouting and sediment isolation, and innovative technologies (onsite fixation, destruction, biological management, sand cover and natural siltation). The Olin report pointed out several difficulties which may be encountered in carrying out any project in the area of HSB between HSBM 4.0 and 2.4.

After evaluation of the August 1, 1985 report, the Review Panel required Olin to proceed with identifying a specific plan for action in Lower Reach A. The plan will be orally presented to the Review Panel at the August 1986 meeting and the formal written plan is due to the Review Panel in October 1986. After evaluation of the October 1986 submission, the Review Panel will proceed with appropriate action.

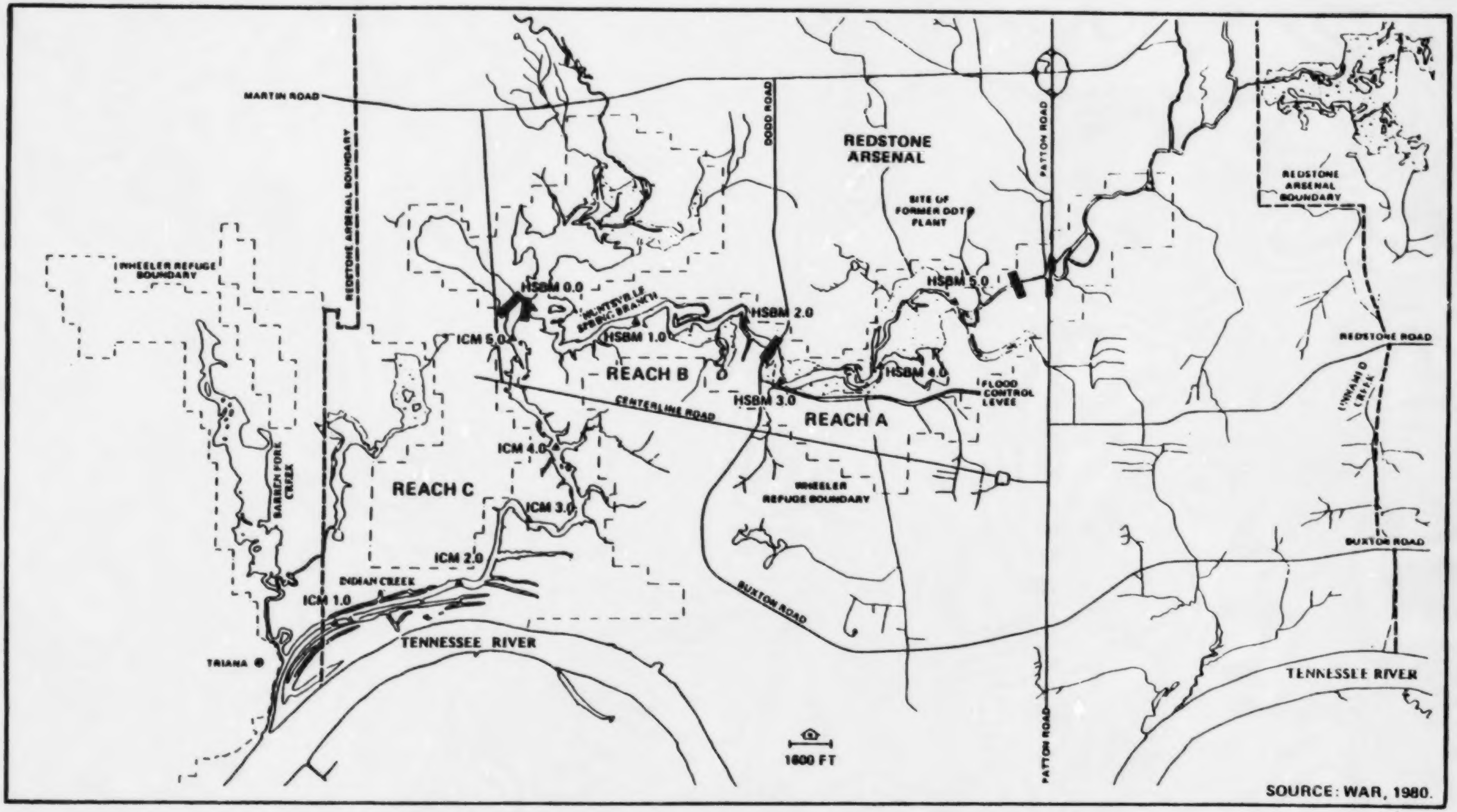
V. REVIEW PANEL LONG-TERM ACTIVITIES

The Review Panel will continue to monitor Olin's progress toward attainment of the performance standard until the requirements of the Consent Decree are satisfied. These oversight activities will include review of all remedial action implementation measures required for compliance with the Consent Decree provisions, evaluation of progress toward attainment of the performance standard, implementation and evaluation of the long-term monitoring program, and if required, determination of any modifications to the remedy. The Review Panel will be responsible for determining when the requirements of the Consent Decree have been satisfied following the procedures established in the Consent Decree.

The Consent Decree sets forth the time for compliance with the performance standard contained in the Consent Decree, and the requirements for termination of the Consent Decree. Specifically, Olin shall attain the performance standard of 5 parts per million (ppm) DDT in fillets of the specified fish species in Reaches A, B, and C, within ten years of completion of the construction and implementation of the remedy. Olin shall be deemed to "attain the performance standard" when the average DDT concentration in the fillets of the three performance standard species (or substitute species, when used) is 5 ppm (or less) in Reaches A, B, and C of the HSB-IC system.

After attainment of the performance standard, Olin shall demonstrate "continued attainment of the performance standard." "Continued attainment of the performance standard" occurs when the average DDT concentration in the fillets of each of the three fish species is 5 ppm (or less) for three consecutive years (including the year of attainment) in Reaches A, B, and C of the HSB-IC system.

The standard for termination of the Consent Decree requires that after Olin (1) demonstrates to the Review Panel continued attainment of the performance standard, and (2) demonstrates to the reasonable satisfaction of the Review Panel that the remedial action implemented pursuant to the Consent Decree has provided, is providing, and will continue to provide achievement of the performance standard once the Consent Decree terminates, Olin shall operate or maintain any remedy(ies) for a period of seven additional years. At the conclusion of the seven-year period, if Olin is in compliance with the provisions of the Consent Decree and the performance standard, Olin shall be deemed to have completely fulfilled all of its obligations thereunder, and the Consent Decree shall terminate.


MARTIN ROAD
REDSTONE ARSENAL BOUNDARY
WHEELER REFUGE BOUNDARY
DODD ROAD
REDSTONE ARSENAL
SITE OF FORMER DDT PLANT
PATTON ROAD
REDSTONE ARSENAL BOUNDARY
HSBM 0.0
HUNTSVILLE SPRING BRANCH
HSBM 1.0
HSBM 2.0
HSBM 3.0
HSBM 4.0
HSBM 5.0
FLOOD CONTROL LEVEE
REDSTONE ROAD
UNNAMED CREEK
ICM 5.0
REACH B
REACH A
CENTERLINE ROAD
ICM 4.0
WHEELER REFUGE BOUNDARY
REACH C
ICM 3.0
BARREN FORK CREEK
ICM 2.0
INDIAN CREEK
ICM 1.0
BUXTON ROAD
BUXTON ROAD
TRIANA
TENNESSEE RIVER
TENNESSEE RIVER
1600 FT
PATTON ROAD

SOURCE: WAR, 1980.

FIGURE 1 General Site Map – Huntsville Spring Branch, Indian Creek, and Vicinity

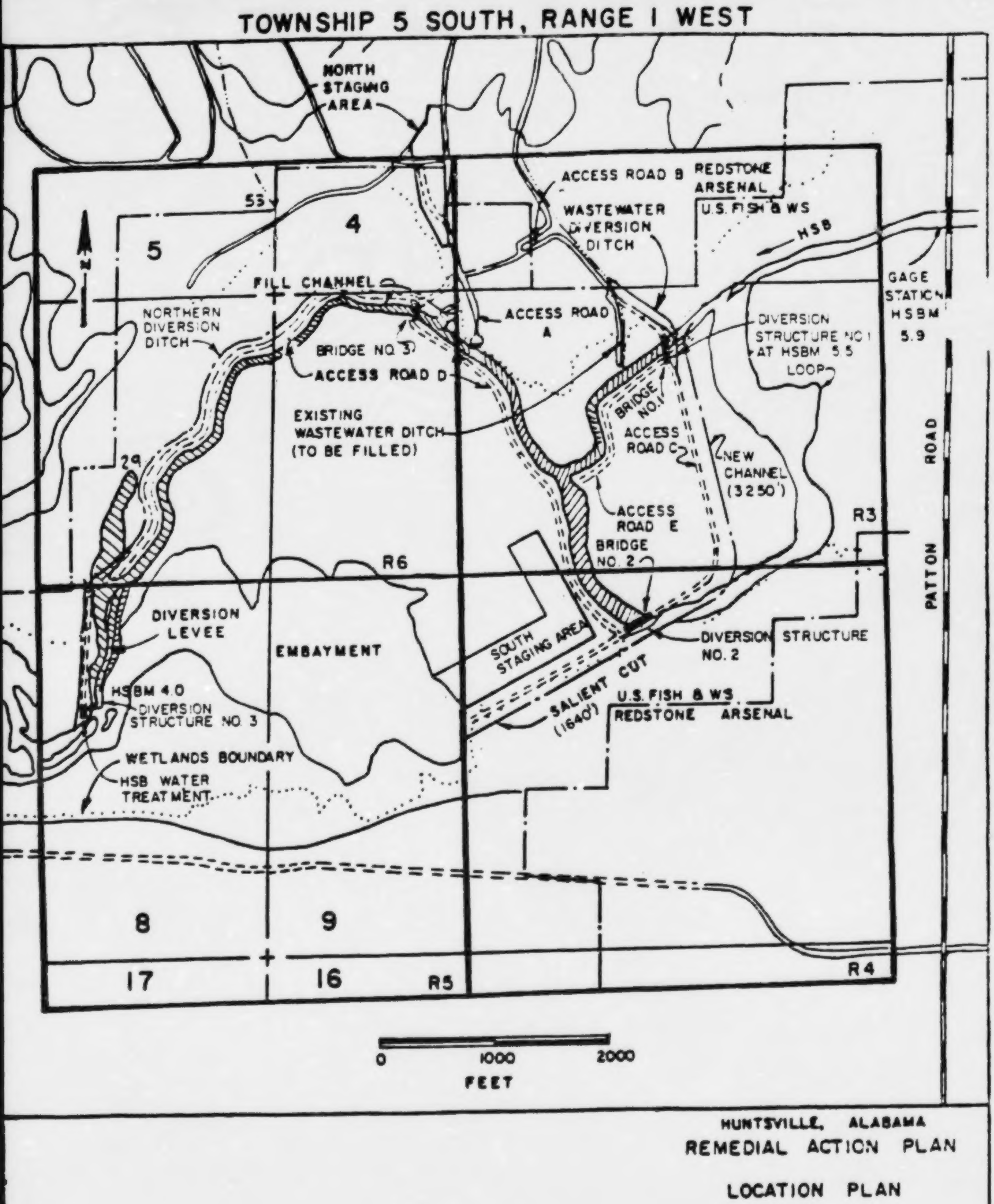
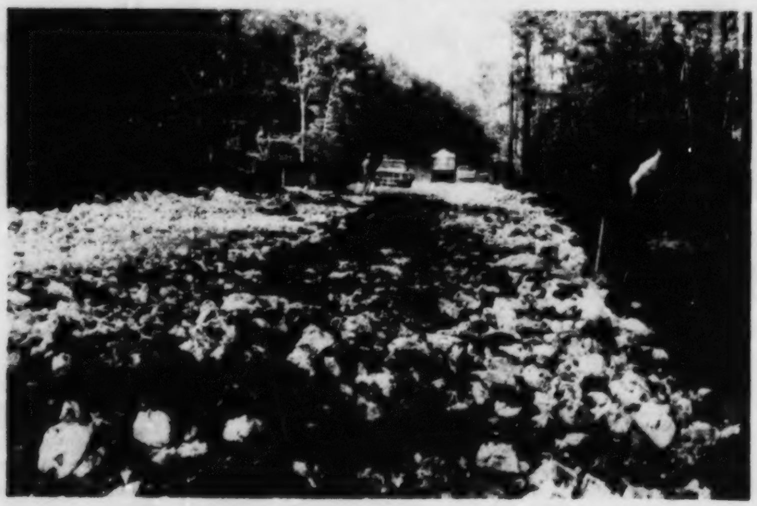

TOWNSHIP 5 SOUTH, RANGE 1 WEST
NORTH STAGING AREA
ACCESS ROAD B
REDSTONE ARSENAL
U.S. FISH & WS
WASTEWATER DIVERSION DITCH
HSB
GAGE STATION HSBM 5.9
55
4
5
N
FILL CHANNEL
NORTHERN DIVERSION DITCH
ACCESS ROAD A
BRIDGE NO. 3
ACCESS ROAD D
DIVERSION STRUCTURE NO. 1 AT HSBM 5.5
LOOP
BRIDGE NO. 1
ACCESS ROAD C
NEW CHANNEL (3250')
EXISTING WASTEWATER DITCH (TO BE FILLED)
29
ACCESS ROAD E
BRIDGE NO. 2
R3
PATTON ROAD
R6
DIVERSION LEVEE
EMBAYMENT
SOUTH STAGING AREA
DIVERSION STRUCTURE NO. 2
SALIENT CUT (1640')
U.S. FISH & WS
REDSTONE ARSENAL
HSBM 4.0
DIVERSION STRUCTURE NO. 3
WETLANDS BOUNDARY
HSB WATER TREATMENT
8
9
17
16
R5
R4
0
1000
2000
FEET
HUNTSVILLE, ALABAMA
REMEDIAL ACTION PLAN
LOCATION PLAN

Figure 2

Reproduced at Government Expense

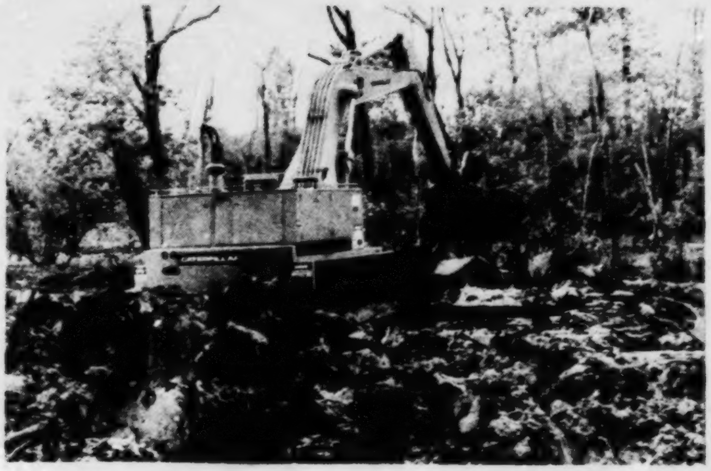
Olin Remedial Project Groundbreaking Ceremony, April 23, 1986, left to Right: Carl L. Baumgartner, Johnson Bros. Constr. Co., Bevan W. Brown, TVA, Verrill M. Norwood, Olin, Howard Benson, FWS, John Ortling, Olin, W. Waynon Johnson, FWS, Dr. Edward S. Bender, EPA, Bruce A. Brye, TVA, Honorable Clyde Foster, Triana, Howard D. Zeller, EPA, Colonel John J. Walker, RSA, Leigh Pegues, ADEM



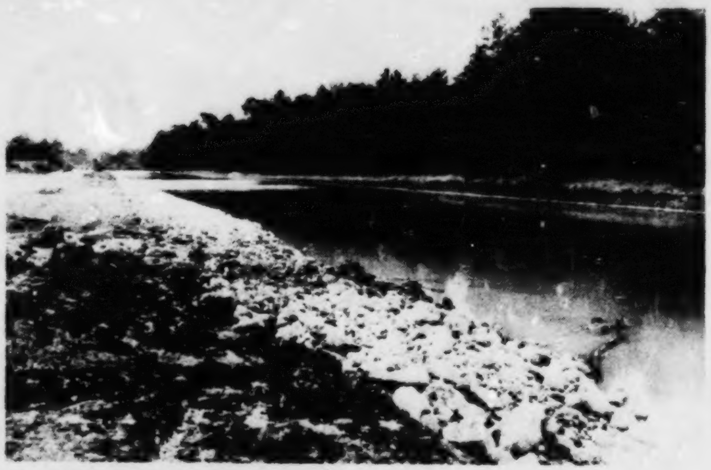
Construction of
Road F
May 9, 1986

Figure 3

Road Construction
to Bridge No. 1
April 21, 1986



Diking on
Bridge No. 1
April 21, 1986



Salient Cut
Opened
June 9, 1986

Figure 4

APPENDIXES

APPENDIX A

CONSENT DECREE

UNITED STATES v. OLIN CORPORATION
(May 31, 1983)

IN THE UNITED STATES DISTRICT COURT FOR THE
NORTHERN DISTRICT OF ALABAMA
NORTHEASTERN DIVISION

UNITED STATES OF AMERICA,

Plaintiff,

v.

OLIN CORPORATION, A Virginia Corporation

Defendant,

TOWN OF TRIANA

Intervenor.

CIVIL ACTION

NO. CV80-PT-5300-NE

STATE OF ALABAMA, ex rel.
CHARLES A. GRADDICK, Attorney
General, et al.,

Plaintiffs,

v.

OLIN MATHIESON CHEMICAL
CORPORATION, a Virginia
Corporation,

Defendant.

CIVIL ACTION

NO. CV79-PT-5174-NE

FILED

MAY 31 1983

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF ALABAMA
JAMES E. VANDEGRIFT, CLERK

ENTERED

MAY 31 1983

CONSENT DECREE

The undersigned have agreed and stipulated that a judgment can be entered in these actions incorporating a settlement agreement containing terms and conditions which include those set forth in this Consent Decree. The parties to this Consent Decree have agreed to its terms conditional upon the filing and approval by the Court of the overall settlement of this case and related cases. The Court has reviewed such terms and conditions and has determined that they are reasonable and adequate to resolve the issues raised in these actions and constitute appropriate relief, including: development and implementation of remedial action to achieve the performance standard and to isolate DDT from people and the environment in the area of the Huntsville Spring Branch ("HSB") - Indian Creek ("IC") tributary system of the Tennessee River ("TR") ("HSB-IC System"); provision of health care and monitoring to Claimants; and mitigation of adverse environmental effects. The Court, having subject matter jurisdiction in these actions,

NOW, THEREFORE, ORDERS, ADJUDGES, AND DECREES AS FOLLOWS:

INTRODUCTION

1. The parties to this Consent Decree are:

(a) United States of America, on behalf of all federal agencies, departments and other entities thereof (all collectively referred to as the "United States");

(b) Olin Corporation, a corporation organized and existing under the laws of the Commonwealth of Virginia with its principal place of business in Stamford, Connecticut ("Olin"); and

(c) State of Alabama, on behalf of all branches agencies, departments, establishments, instrumentalities, bureaus, subsidiaries, boards or commissions and any other entity of the Government of the State of Alabama (all collectively referred to as the "State").

The terms of this Consent Decree shall bind the parties hereto and their successors and assigns.

2. The HSB enters Redstone Arsenal ("RSA") from the City of Huntsville, Alabama. It flows through RSA and the Wheeler National Wildlife Refuge and converges with IC at HSB Mile ("M") 0.0. IC flows into the TR near Triana at TRM 321 (ICM 0.0). For purposes of this Consent Decree, the HSB-IC System is defined as that portion of HSB beginning at HSBM 5.4 to HSBM 0.0, and that portion of IC from ICM 5.6 to ICM 0.0. The HSB-IC System is depicted on the Figure attached hereto as Exhibit"A." In the "Engineering and Environmental Study of DDT Contamination of Huntsville Spring Branch, Indian Creek and Adjacent Lands and Waters, Wheeler Reservoir, Alabama" Vols. 1-3, November, 1980, by Water and Air Research, Inc. ("W.A.R. Report"), the HSB-IC System is divided into three reaches: Reach A, Reach B, and Reach C. Reaches A, B, and C are defined in the W.A.R. Report as follows:

Reach A - Begins at HSBM 5.4 and extends to HSBM 2.4;

Reach B - Begins at HSBM 2.4 and extends to HSBM 0.0; and

Reach C - Begins at ICM 5.6 and extends to ICM 0.0.

For the purposes of this Consent Decree, Reaches A, B and C are defined as they are in the W.A.R. Report.

3. DDT is defined for purposes of this Consent Decree as: 1,1,1-trichloro-2,2-bis-(p-chlorophenyl) ethane, including its isomers, and the degradation products and metabolites DDD or TDE (1,1-dichloro-2,2-bis (p-chlorophenyl) ethane), and DDE (1,1-dichloro-2,2-bis (p-chlorophenyl) ethylene), and the isomers thereof.

4. The United States filed a Complaint on December 4, 1980 and an Amended Complaint on February 5, 1982. The United States' complaint as amended alleges an imminent and substantial endangerment to human health and the environment as a result of Olin's alleged discharge of DDT into the waters of the United States, the Wheeler National Wildlife Refuge, and the environment from a former manufacturing plant located at RSA in northern Alabama, and seeks appropriate relief under federal statutory law and under common law. The State filed a complaint and amended complaint alleging these same facts and seeks relief similar to that requested by the United States. Olin filed answers and motions to dismiss and denied liability in these actions.

5. To resolve this matter constructively, to avoid prolonged litigation, to permit efficient implementation of the remedies to be performed pursuant to this Consent Decree, to provide health care and monitoring to Claimants, and to further the public interest, the United States, Olin, and the State, have agreed to forego their respective claims, allegations, responses and defenses to these

actions and to enter into this Consent Decree. This Consent Decree is part of an overall settlement of the following claims and actions:

a. *James Cloud, et al. v. Olin Corporation*, In the United States District Court for the Northern District of Alabama, Northeastern Division, Civil Action File No. CV79-PT-5128-NE;

b. *Marvelene T. Freeman, et al. v. Olin Corporation*, In the United States District Court for the Northern District of Alabama, Northeastern Division, Civil Action File No. CV80-PT-5057-NE;

c. *Erskine Parcus, et al. v. Olin Corporation*, In the United States District Court for the Northern District of Alabama, Northeastern Division, Civil Action File No. CV80-PT-5098-NE;

d. *State of Alabama ex rel Charles A. Graddick, Attorney General, Charles A. Graddick, Attorney General* v. *Olin Corporation, a Virginia Corporation*, In the United States District Court for the Northern District of Alabama, Northeastern Division, Civil Action File No. CV79-PT-5174-NE;

e. *United States of America v. Olin Corporation, a Virginia Corporation*, In the United States District Court for the Northern District of Alabama, Northeastern Division, Civil Action File No. CV80-PT-5300-NE;

f. *Annie Mae Charest, et al. v. Olin Corporation, a Virginia Corporation, et al*., In the United States District Court for the Northern District of Alabama, Northeastern Division, Civil Action File No. CV81-PT-5367-NE; and

g. Administrative tort claims filed against the United States relating to, among other

> things, DDT, allegedly discharged into the waters of the United States, the Wheeler National Wildlife Refuge, and the environment in the vicinity of RSA in northern Alabama.

6. The parties to this Consent Decree have agreed to its terms conditional on the filing with and approval by the Court of the overall settlement, including this Consent Decree. The public notice requirements of 28 C.F.R.§50.7 will be complied with, and this Consent Decree is to be entered only after the provisions of that regulation have been met.

PURPOSE OF THE CONSENT DECREE

7. The purpose of the remedy(ies), monitoring and other actions which Olin is required to perform under this Consent Decree is to isolate DDT in the HSB-IC System from people and the environment and to minimize transport of DDT out of the HSB-IC System to protect human health and the environment.

REMEDIAL ACTIONS

8. Olin shall implement remedial actions required by this Consent Decree and consistent with the "Joint Technical Proposal to Implement Remedial Activities Pursuant to Consent Decree" (the "Proposal", Exhibit "B" hereto).

9. Olin shall develop remedy(ies) pursuant to the requirements of this Consent Decree to achieve and continue to achieve the performance standard under the terms of this Consent Decree.

10. Olin shall conduct monitoring studies of fish, water, sediment, and sediment transport, as set forth in the Proposal and pursuant to this Consent Decree, to obtain baseline data and to evaluate the effectiveness of the remedy(ies). Olin shall also conduct studies of groundwater as set forth in the Proposal. Selected monitoring activities will continue beyond the time for attainment of the performance standard.

11. The baseline monitoring program is to begin no later than the date of entry of this Consent Decree.

PERFORMANCE STANDARD

12. The performance standard is a DDT level of 5 parts per million ("ppm") in the fillets of channel catfish, largemouth bass and smallmouth buffalo, in Reaches A, B, and C. Methods for measuring DDT levels in fish are set forth in the Proposal. In the event that one of the three fish species identified above cannot be obtained in any one of the Reaches, Olin and the RP shall agree upon one or more substitute fish species for that Reach. In the event of a disagreement, the RP shall designate such substitute fish species.

GOALS AND OBJECTIVES

13. The performance standard shall be achieved consistent with the following Goals and Objectives:

a. Isolate DDT from people and the environment in order to prevent further exposure;

b. Minimize further transport of DDT out of the HSB-IC System;

c. Minimize adverse environmental impact of remedial actions;

d. Mitigate effect of DDT on wildlife habitats in the Wheeler National Wildlife Refuge;

e. Minimize adverse effects on operations at RSA, Wheeler Reservoir, and Wheeler National Wildlife Refuge;

f. No increase in flooding, particularly at City of Huntsville and RSA, except those increases in water levels which can be reasonably expected in connection with the implementation of remedial action, provided Olin takes all reasonable steps to minimize or prevent such increase; and

g. Minimize effect on loss of storage capacity for power generation, in accordance with the Tennessee Valley Authority Act ("TVA Act").

REVIEW PANEL

14. A Review Panel ("RP") is to be established promptly consisting of members designated by each of: United States Fish and Wildlife Service, TVA, EPA, the United States Army, and the State. The Town of Triana, Alabama and Olin shall serve as non-voting participants on the RP. An EPA representative shall be the chairperson of the RP. The RP shall meet semiannually and may hold special meetings as appropriate. The decisions of the RP shall be by majority vote of the members, and the RP shall establish its own operating procedures. The members of the RP shall have the right to deliberate in sessions restricted to members only. Each entity appointing a member to the RP shall be responsible for its own expenses in connection with its respective member's service on the RP.

15. The RP shall review the data collected pursuant to the Proposal and this Consent Decree and Olin's proposed remedy(ies). In proposing and reviewing the initial remedy pursuant to the Consent Decree, Olin and the RP shall act in good faith, shall fully cooperate, and shall use their best efforts to agree upon an initial remedy consistent with this Consent Decree. Pursuant to the schedule in this Consent Decree, the RP shall either approve Olin's proposed initial remedy, monitoring plan, and construction and implementation schedule, subject to compliance with applicable law; disapprove the proposed initial remedy and monitoring plan, and, pursuant to a designated schedule, require submission of a modified remedy and monitoring plan with a schedule for construction and implementation; or designate a substitute remedy and monitoring plan with a schedule for construction and implementation.

16. If the RP determines, pursuant to paragraph 20 below, that a modification to the remedy implemented by Olin is necessary, it shall specify a schedule for Olin's submission of such modification. Olin shall submit such modifications in accordance with the schedule, and thereafter the RP shall follow the procedure specified in paragraph 15.

17. Olin must implement the remedy(ies) approved or designated by the RP pursuant to the schedule for construction and implementation of the remedy(ies) or seek relief from the Court pursuant to paragraph 22 below.

18. Olin shall submit quarterly reports of its monitoring data to the RP and reports relating to the development of significant information in a format to be agreed upon by the RP and Olin. The quarterly reports shall include, at a minimum, a summary of the data collected and the raw data. Olin shall also submit a quarterly report of its progress in meeting the schedule for construction and implementation of the remedy(ies) undertaken pursuant to this Consent Decree.

19. Interim goals to indicate progress toward attainment of the performance standard will be set pursuant to paragraph 29 below, after selection of the initial remedy.

20. The RP shall, semiannually, review the monitoring data gathered pursuant to the Proposal and this Consent Decree and the remedy(ies) implemented, shall compare the data to the interim goals, and shall determine whether Olin is making appropriate progress in meeting the performance standard. The RP shall determine whether a remedy(ies) or remedy implementation is inadequate and if it determines that a modification of the remedy is necessary, it shall act in accordance with paragraph 16 above.

21. In determining whether remedial actions are appropriate, the RP shall consider the following factors:

(a) The nature of the endangerment to human health and the environment which the remedial action is designed to address;

(b) The extent to which implementation of the remedial action would reduce or increase endangerment to human health or the environment, or would otherwise affect human health or the environment;

(c) Whether implementation of such remedies is unnecessary to satisfy or is inconsistent with the Goals and Objectives set forth in paragraph 13 herein, and the performance standard; and

(d) Whether the remedy chosen is the most cost-effective means of accomplishing the performance standard.

JUDICIAL REVIEW

22. Olin shall be required to implement the remedial actions required by the RP unless, upon petition by Olin, the Court determines, upon the evidence:

(a) That implementation of such remedy(ies) is unnecessary to satisfy or is inconsistent with the Goals and Objectives set forth in paragraph 13 herein, and the performance standard; or

(b) that considering:

(i) The nature of the endangerment to human health or the environment which the remedial action is designed to address;

(ii) The extent to which implementation of the remedial action would reduce or increase endangerment to human health or the environment, or would otherwise affect human health or the environment; and

(iii) Whether the remedy(ies) chosen is the most cost-effective means of accomplishing the performance standard,

it would be arbitrary or capricious to require Olin to implement the remedy(ies).

SCHEDULE FOR REMEDIAL ACTION DEVELOPMENT

23. By June 1, 1984, Olin shall complete the necessary monitoring studies outlined in the Proposal, shall submit the data gathered pursuant thereto, and shall specify an initial remedy to the RP. Olin's proposal for an initial remedy shall include a schedule for implementation, a monitoring plan, and the other information required in paragraph 52 below.

24. By September 1, 1984, the RP shall take action in accordance with paragraph 15.

25. Olin shall complete construction and implementation of the initial remedy and any subsequent remedies required under this Consent Decree pursuant to the schedule established under paragraph 15.

26. Within 10 years from the date of "completion" of the construction and implementation of the initial remedy (as that event is determined pursuant to paragraphs 15 and 52(j)), Olin shall attain the performance standard in Reaches A, B, and C. The definition of "attain the performance standard" is set forth in the Proposal in Section 7.0.

27. After attainment of the performance standard, Olin shall demonstrate "continued attainment of the performance standard". The definition of "continued attainment of the performance standard" is set forth in the Proposal in Section 7.0.

28. Once Olin attains the performance standard, it shall operate or maintain, as necessary, any remedy(ies) (including bird repelling devices) implemented pursuant to this Consent Decree until termination of the Consent Decree pursuant to paragraph 54 below.

29. To evaluate Olin's progress toward attaining the performance standard within the schedule set forth in paragraph 26, interim performance goals shall be established. Interim performance goals will be agreed upon by Olin and the RP; in the unlikely event that Olin and the RP cannot agree on interim performance goals, the RP shall set such goals after selection and approval of the initial remedy. The interim performance goals shall be expressed in terms of reductions of DDT levels or particular ranges of DDT levels in fish fillets, as specified in paragraph 12 above, for certain time periods.

FINANCIAL SECURITY

30. If at any time prior to the completion of construction and implementation of the initial remedy and any subsequent remedy(ies) required under this Consent Decree, (i) the consolidated net worth of Olin declines by fifteen percent (15%) or more in any one fiscal quarter, or (ii) over a period of three consecutive fiscal quarters the consolidated net worth of Olin declines by a total of fifteen percent (15%) or more as compared with the consolidated net worth of Olin as of the beginning of the first of such quarters, or (iii) if the consolidated net worth of Olin declines by fifteen percent (15%) or more in any one fiscal year, or (iv) if the consolidated net worth of Olin declines at any time to five hundred million dollars ($500,000,000) or below, Olin shall immediately notify the United States and shall promptly provide security in an amount equal to one hundred and twenty-five percent (125%) of the estimated cost to complete such construction and implementation. If such event occurs prior to the identification and estimation of the cost of the initial remedy(ies), the amount of such security shall be twenty million dollars ($20,000,000). Such security shall take the form of a first lien on valuable assets, a performance bond, a surety bond, a letter of credit or a cash bond. The parties may hereafter agree upon other forms of similar security. If at any time the United States believes the foregoing "net worth" test is insufficient security for Olin's performance under the Consent Decree, it may

petition the Court to order Olin to produce the security set forth above.

INSURANCE

31. Olin agrees to be responsible for the liability arising from its acts and omissions occuring during the term of this Consent Decree. Olin agrees that it, and independent contractors employed by it to perform any work pursuant to this Consent Decree, shall maintain for the duration of this Consent Decree general liability and automobile insurance with limits of ten million dollars ($10,000,000) combined single limit, with no sudden and accidental pollution exclusion clause, and Alabama Statutory Workmans Compensation Insurance. Olin and independent contractors employed by it further agree to perform all work pursuant to this Consent Decree in a workmanlike manner.

DELAY OR PREVENTION OF PERFORMANCE

32. Olin shall take all reasonable measures to minimize or avoid any delay or prevention of the performance of its obligations pursuant to this Consent Decree. If any event occurs, or if Olin anticipates that an event will occur, which would delay or prevent the performance of Olin's obligations pursuant to this Consent Decree ("Delaying Event"), Olin shall notify the United States Program Coordinator in writing as soon thereafter as possible, but in no event later than 20 days after becoming aware of such Delaying Event. The written notice shall fully describe the actual or

anticipated length and cause of such Delaying Event, the actions Olin has taken, and proposes to take, to prevent and to minimize the impact of the Delaying Event, and the schedules for taking such actions.

33. To the extent that Delaying Events have been or will be caused by *force majeure*, *i.e.*, acts of God, strikes, fires, war, or other causes beyond Olin's control, the time for performance hereunder shall be extended as appropriate. Increased costs or expenses associated with the implementation of actions required by this Consent Decree shall not alone be considered a *force majeure* event.

34. If the United States and Olin agree on the occurrence and length of a Delaying Event, they shall file with this Court a stipulation and proposed order extending the time for Olin to perform the activity(ies) affected by the Delaying Event. If, however, Olin and the United States do not so stipulate or the United States advises Olin in writing that it does not agree that a Delaying Event occurred or to the extension of time sought by Olin, either Olin or the United States may submit the matter to the Court for resolution. Olin shall have the burden of proof, based upon a preponderance of the evidence, (i) that the Delaying Event excused or extended the time for Olin's performance under the terms of this paragraph and (ii) that the time extension sought is appropriate. Any extension of the schedule for performance of an intermediate

requirement agreed or ordered pursuant to this paragraph shall not result in the automatic extension of a subsequent requirement.

35. If a Delaying Event is not excusable under the terms of this Consent Decree or if after an excusable Delaying Event occurs, the time extension sought by Olin is unjustified, Olin shall be subject only to the following stipulated penalties for such unexcused failure to comply with the following paragraphs of this Consent Decree:

A. Paragraphs 16 and 18

   (i) Fifty dollars ($50) per day for the first fifteen days; and

   (ii) Two hundred fifty dollars ($250) per day thereafter.

B. Paragraphs 23, 25, 27, 28, and 41

   (i) Five hundred dollars ($500) per day for the first fifteen days;

   (ii) Seven hundred fifty dollars ($750) per day for the sixteenth to ninetieth days; and

   (iii) Up to twenty five hundred dollars ($2500) per day thereafter.

C. Paragraph 26

   (i) One thousand dollars ($1000) per day for the first sixty days; and

   (ii) Up to five thousand dollars ($5000) per day thereafter.

36. In determining the amount of any penalty which the United States seeks to assess under subparagraphs 35.B.(iii) and C.(ii),

the United States shall consider the economic savings, if any, to Olin for its delay or failure to comply with such paragraphs, the degree or seriousness of the delay or non-compliance, the duration of the delay or non-compliance, the degree of endangerment to human health or the environment, if any, resulting from the delay or non-compliance, and other relevant factors. Provided, however, that no payment shall be assessed for each day that compliance is delayed or excused pursuant to this Consent Decree, or by order of the Court.

37. If the United States seeks to assess penalties pursuant to paragraph 35 of this Consent Decree, it shall give written notice to Olin of the requirement with which Olin has not timely complied or has failed to comply, the amount of the proposed penalty and, in the case of penalties to be assessed pursuant to subparagraphs 35.B.(iii) and C.(ii), the basis for such amount, taking into account the factors set forth in paragraph 36. Such notice from the United States shall be a condition precedent to the United States' right to seek enforcement of such penalty assessment under paragraph 38 of this Consent Decree. Within ten (10) days of its receipt of such notice, Olin shall notify the United States whether it agrees to pay such proposed penalty. If Olin agrees to pay such penalty, it shall do so within twenty (20) days from receipt of such notice by check payable to the Treasurer of the United States and sent to the Assistant Attorney General at the address specified in paragraph 51.

38. If the United States and Olin do not agree to the amount of the penalty which the United States seeks to assess against Olin, the United States may petition the Court to enter judgment against Olin for the amount of the penalties it seeks hereunder. The foregoing petition by the United States shall set forth the requirement with which Olin has failed to comply, shall propose amounts to be paid and, in the case of penalties sought pursuant to subparagraphs 35.B.(iii) and C.(ii), the basis for such proposed amounts, taking account of the factors set forth in paragraph 36 of this Consent Decree. The United States shall have the burden of proof, by a preponderance of the evidence, that the amounts of money it seeks under subparagraphs 35.B.(iii) and C.(ii) are justified; the United States shall have no burden of proof with respect to the stipulated penalties set forth in subparagraphs 35.A., 35.B.(i), (ii), and 35.C.(i).

39. Any penalty payments made or collected pursuant to paragraphs 35 through 38 shall be payable only to the United States and shall be in full satisfaction of all civil claims by any party or the Town of Triana, Alabama for fines, penalties, or other monetary assessments arising out of Olin's failure to comply with this Consent Decree, except those specific monetary obligations imposed pursuant to paragraphs 41, 42 and 43. Olin shall be subject to civil fines, penalties, or other monetary assessments arising out of its failure to comply with this Consent Decree only as provided in

paragraph 35. Notwithstanding anything in this Consent Decree to the contrary, the provisions of paragraphs 35 through 39 shall not be construed to limit any equitable or other non-monetary relief which may be available to the United States for violations of this Consent Decree or bar the United States from seeking any appropriate relief, equitable, monetary or otherwise, which may be available to the United States for violations of law arising during and in connection with Olin's performance under this Consent Decree.

40. If Olin and the United States agree that Olin has acted in good faith consistent with the schedule set forth in this Consent Decree but has failed to meet the performance standard within the time set forth herein, Olin and the United States shall agree to an extension of time for meeting the performance standard, shall jointly petition the Court for a modification of the schedule and Olin shall not be liable for penalties set forth in paragraph 35 based solely on its failure to meet the performance standard within the time required during such extended period. In the event of a disagreement concerning whether Olin has acted in good faith, Olin shall have the burden of proof, by a preponderance of the evidence, that it has acted in good faith.

REMEDIAL ACTION MITIGATION MEASURES

41. Olin agrees to install and maintain bird repelling measures or bird repelling devices as required by remedial actions undertaken pursuant to this Consent Decree. Olin further agrees

upon entry of this Consent Decree to pay into a trust fund the sum of $375,000 for the purpose of funding mitigation measures (such as studies or structures) to be selected by the United States in furtherance of the goals of the statutes cited in the first amended complaint of the United States in the above-styled action.

EXPENSES

42. Olin shall bear the reasonable expenses incurred by the United States for contracts to monitor Olin's activities, including data collection and analysis, in connection with this Consent Decree. From and after the date of entry of this Consent Decree, Olin shall bear, without its prior approval, such expenses in an amount not to exceed $10,000 per year until it demonstrates continued attainment of the performance standard as provided for herein with prior notice of such expenditures to be given to Olin. Upon request of Olin, the United States shall provide a brief description of the work to be performed under contracts entered into pursuant to this paragraph and substantiation for the expenses thereof. In any event, if the Government does not expend the sum of $10,000 in any one year, the Government may not carry over such unused sums in any subsequent year, it being expressly understood that Olin's obligations under this paragraph are limited to a total of $10,000 per year. Olin shall reimburse such expenses in excess of $10,000 per calendar year only if it has given prior approval to such expenditures.

43. In addition, Olin agrees to pay for the cost of developing any environmental impact statements or environmental assessments which may be required pursuant to NEPA in order to implement any remedies under this Consent Decree.

EMPLOYMENT PREFERENCE

44. Olin agrees to give employment preference (consistent with applicable law) for all work related to development and implementation of this settlement including, but not limited to, construction work, to "Claimants," as the term is defined in the "Comprehensive Agreement Regarding Compromise of Claims" and to anyone else who resides in the immediate area of Triana, Alabama who agrees to sign a release and waiver of any liability against the United States and Olin, arising from the presence of DDT in the HSB-IC System. The parties hereto do not intend this paragraph to create and the provisions of this paragraph shall not create any enforceable rights of action or any remedies on behalf of either the parties to this Consent Decree or individuals or entities who are not parties to this Consent Decree.

INSPECTION

45. The United States, the State, and their agencies and authorized representatives, including contractors and consultants, shall, upon notice, be provided reasonable access at all times to the site of any actions taken within the HSB-IC System pursuant to this Consent Decree to observe and monitor the work performed by

Olin, to collect samples, to inspect records and for any other lawful purpose relating to assuring compliance by Olin with the terms of this Consent Decree. Nothing in this paragraph is intended to limit any other lawful rights of access or inspection which the United States or the State of Alabama may have with respect to the site or to affect the right of the United States Army to restrict access as necessary.

EFFECT OF CONSENT DECREE

46. Nothing contained in this Consent Decree shall constitute an admission of law or fact or may be introduced into evidence as proof of same, or constitute proof of the violation of any law or regulation. The parties hereto may rely upon this Consent Decree only in this action or in any of the other actions listed in paragraph 5, above. The parties hereto may not rely upon this Consent Decree in any other action or proceeding, and neither this Consent Decree nor any part hereof may be introduced into evidence in any other action or proceeding. Except for the right of the Town of Triana, Alabama to enforce this Consent Decree, as provided in an order entered contemporaneously herewith, it is intended that this Consent Decree shall neither create nor have any effect upon rights of persons or entities not parties to this Consent Decree.

PROGRAM COORDINATOR.

47. The United States and Olin shall each designate a program coordinator and an alternate within 15 days following the date of

entry of this Consent Decree. At any time, Olin and the United States may appoint new coordinators, alternates or both, and notice thereof shall be given in writing.

48. Olin and the United States intend that communications between them to carry out the terms and conditions of this Consent Decree shall be by and between the program coordinators or alternates. The coordinators designated by the parties shall be deemed agents for purposes of receiving proposals, reports and notifications from other parties, except that the coordinators shall not constitute agents for the purpose of receiving service of process, subpoenas, or other judicial or administrative process, and each coordinator shall be responsible for assuring that all communications from the other are appropriately disseminated and processed.

COMPLIANCE WITH ALL LAWS

49. All work undertaken pursuant to this Consent Decree is to be performed in accordance with all applicable federal, state and local statutes, regulations, ordinances and permits, including, but not limited to the following statutes which may be applicable to the work undertaken pursuant to this Consent Decree: the National Environmental Policy Act, 42 U.S.C. §§4371, et seq., the Fish and Wildlife Coordination Act, 16 U.S.C. §§661-666c, the Endangered Species Act, Pub. L. No. 93-205, 87 Stat. 884 (codified as amended in scattered sections of 7 and 16 U.S.C.), the National Wildlife Refuge

System Administration Act, 16 U.S.C. §§668dd-668ee, the Tennessee Valley Authority Act, 16 U.S.C. §831 as amended by Pub. L. No. 96-97, 93 Stat. 730, the Clean Water Act, 33 U.S.C. §§1251 et seq., the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq., the Comprehensive Environmental Response, Compensation and Liability Act, ("CERCLA"), 42 U.S.C. §§9601 et seq., the Occupational Safety and Health Act, 29 U.S.C. §§651 et seq., the Hazardous Waste Management Act of 1978, Code of Ala. 1975, §§22-30-1 et seq. (1982 cum. supp.), the Alabama Water Pollution Control Act, Code of Ala. 1975 §§22.22-1 et seq. (1982 cum. supp.), and all applicable regulations promulgated thereunder, including without limitation, the revised National Contingency Plan, 40 C.F.R. Part 300 et seq., as published in 47 Fed. Reg. 31180 (July 16, 1982). Olin shall apply for and use its best efforts to obtain any permits or authorizations required by applicable federal, state or local law in carrying out the work required of Olin under this Consent Decree.

EXPENSES UNDER CERCLA

50. In consideration of the entry of this Consent Decree, Olin agrees not to make any claims pursuant to Section 112 of CERCLA, 42 U.S.C. §9612, against the Fund established by that Act for expenses related to this case and this Consent Decree.

NOTICES

51. All notices and documents required to be provided to the United States, Olin and the State pursuant to this Consent Decree, unless otherwise stated, shall be addressed as follows:

Assistant Attorney General
Land and Natural Resources Division
Department of Justice
9th & Pennsylvania Avenue, N.W.
Washington, D.C. 20530

United States Environmental Protection Agency
Regional Administrator
Region 4
Atlanta, GA 30309

State of Alabama
Attorney General
250 Administrative Building
Montgomery, Alabama 36130

Olin Corporation
120 Long Ridge Road
Stamford, CT 06904

DOCUMENTS

52. In submitting its initial proposed remedy and any subsequent or modified remedies to the RP, Olin shall submit, in addition to the other information required by this Consent Decree, at a minimum the following information:

(a) References to all scientific and/or technical literature used in preparation of the remedy;

(b) Engineering diagrams, chemical analyses, and all other technical data used in proposing the remedy;

(c) Names, titles and disciplines of all professionals engaged in preparation of the remedy;

(d) A description of all analytical techniques and protocols used in preparing the remedy;

(e) Anticipated effects on people and the environment of any actions to be implemented under the remedy, including, as applicable, the information described in section 8 of the Proposal;

(f) Cost and time to implement the proposed remedy(ies);

(g) A discussion of all alternative remedies examined but rejected including, where developed, cost, time to implement, and other data and the reasons for concluding that each alternative remedy is not necessary or appropriate to attain the performance standard;

(h) A specific monitoring plan for determining the efficacy of the remedial action implemented, including monitoring activities continuing beyond the time for attainment of the performance standard;

(i) Any health and safety plans required by law to implement the remedy(ies);

(j) Construction and implementation schedules, including a schedule for the development and submission of detailed engineering specifications and a designation of the event which signifies "completion" of construction and implementation of the initial remedy; and

(k) The assumptions on which the remedy(ies) are based.

RETENTION OF JURISDICTION

53. This Court retains jurisdiction over the parties to this Consent Decree to enforce compliance with its terms, to construe the

Consent Decree, and to resolve disputes in accordance with its provisions.

TERMINATION OF CONSENT DECREE

54. After Olin (1) demonstrates to the RP continued attainment of the performance standard and (2) demonstrates to the reasonable satisfaction of the RP that the remedy(ies) implemented pursuant to this Consent Decree has provided, is providing and will continue to provide achievement of the performance standard once this Consent Decree terminates, Olin shall operate or maintain such remedy(ies), as set forth in paragraph 28, for a period of seven additional years. At the conclusion of this seven year period, if Olin is in compliance with the provisions of this Consent Decree and the performance standard, Olin shall be deemed to have completely fulfilled all of its obligations hereunder, and this Consent Decree shall terminate.

MISCELLANEOUS PROVISIONS

55. All information and documents submitted by Olin to the United States, State or RP pursuant to this Consent Decree shall be subject to public inspection.

56. The terms and conditions of this Consent Decree shall include the terms and conditions contained in the Proposal attached hereto, which are incorporated herein by reference.

~~57. In the event of changed material circumstances of law or environmental or health standards, arising after the entry of this~~

57. In the event of changed material circumstances of law or environmental or health standards, arising after the entry of this Consent Decree, the United States or Olin may petition the Court for a modification of the Consent Decree.

58. Each party shall bear its own costs, disbursements and attorneys' fees of this action.

59. The parties represent to the Court that their respective undersigned counsel and the other signatories have full authority to approve the terms and conditions of this Consent Decree and to execute and legally bind the respective parties to this Consent Decree.

UNITED STATES OF AMERICA

By: Anthony C Liotta
ANTHONY C. LIOTTA
Deputy Assistant Attorney General
Land and Natural Resources Division
United States Department of Justice

DATED: 4/13/83

Frank Donaldson
FRANK DONALDSON
United States Attorney
Northern District of Alabama

DATED: 4/15/83

Henry Frohsin

HENRY FROSHIN
First Assistant United States
Attorney

DATED: 4/15/83

Elizabeth Todd Campbell

ELIZABETH TODD CAMPBELL
Assistant United States Attorney

DATED: 4/15/83

Kenneth A. Reich

KENNETH A. REICH
Attorney
United States Department of Justice

DATED: 4/13/83

LOIS J. SCHIFFER
Attorney
United States Department of Justice

DATED: 4/13/83

David C. Batson

DAVID BATSON
Attorney
United States Environmental
Protection Agency

DATED: 4/12/83

Arthur Wesley Ray

ARTHUR RAY
Attorney
United States Environmental
Protection Agency

DATED: 4/12/83

ELIZABETH TODD CAMPBELL
Assistant United States Attorney DATED: ________

KENNETH A. REICH
Attorney
United States Department of Justice DATED: ________

LOIS J. SCHIFFER
Attorney
United States Department of Justice DATED: ________

DAVID BATSON
Attorney
United States Environmental
Protection Agency DATED: ________

ARTHUR RAY
Attorney
United States Environmental
Protection Agency DATED: ________

ANNE L. ASBELL
Assistant Regional Counsel
United States Environmental
Protection Agency
Region IV DATED: April 14 1983

ANNE L. ASBELL
Assistant Regional Counsel
United States Environmental
Protection Agency
Region IV

DATED: __________

STATE OF ALABAMA

By: Charles A. Graddick
CHARLES A. GRADDICK
Attorney General of the
State of Alabama

DATED: 4/14/83

R Craig Kneisel
R. CRAIG KNEISEL
Assistant Attorney General
State of Alabama

DATED: 4/14/83

OLIN CORPORATION

By: ____________________
E. MCINTOSH COVER
Group Counsel
Olin Chemicals Group

DATED: __________

____
MYRON B. SOKOLOWSKI
Counsel
Olin Chemicals Group

STATE OF ALABAMA

By:

CHARLES A. GRADDICK
Attorney General of the
State of Alabama

DATED:

R. CRAIG KNEISEL
Interim General Counsel
Department of Environmental
Management

DATED:

OLIN CORPORATION

By:

E. MCINTOSH COVER
Group Counsel
Olin Chemicals Group

DATED: 4/22/83

MYRON B. SOKOLOWSKI
Counsel
Olin Chemicals Group

STUART N. ROTH
Associate Counsel
Olin Chemicals Group

DATED: 4/21/83

G. LEE GARRETT, JR.
Hansell & Post
Attorneys for Olin Corporation

DATED: 4/15/83

Entered in accordance with the foregoing Consent Decree.

UNITED STATES DISTRICT JUDGE

DATED: May 31, 1983

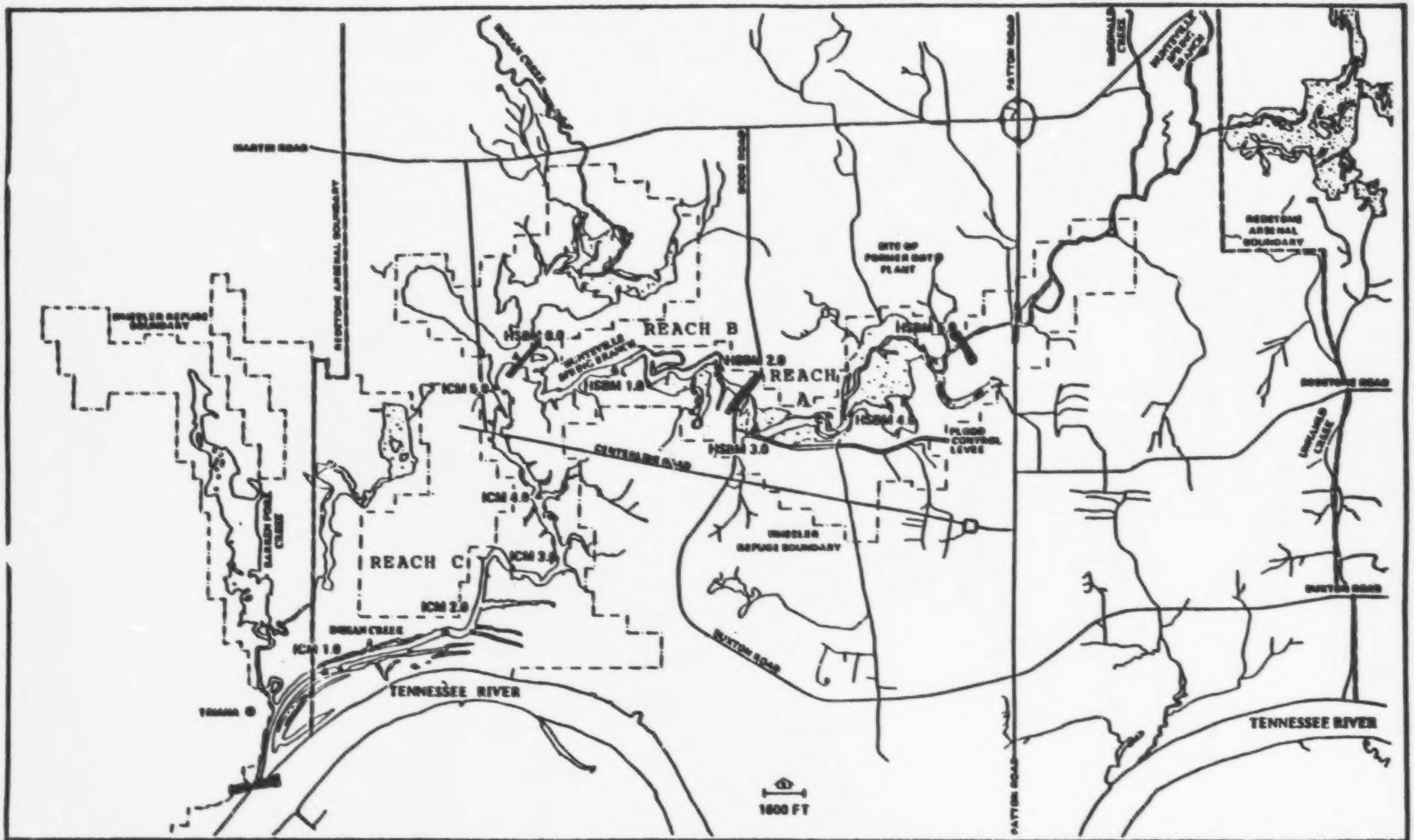

MARTIN ROAD
INDIAN CREEK
REDSTONE ARSENAL BOUNDARY
WHEELER REFUGE BOUNDARY
BARREN FORK CREEK
REACH B
REACH A
REACH C
HSBM 0.0
HSBM 1.0
HSBM 2.0
HSBM 3.0
HSBM 4.0
HSBM 5.0
HUNTSVILLE SPRING BRANCH
ICM 5.0
ICM 4.0
ICM 3.0
ICM 2.0
ICM 1.0
INDIAN CREEK
CENTERLINE RANGE
DODD ROAD
SITE OF FORMER DDT PLANT
FLOOD CONTROL LEVEE
WHEELER REFUGE BOUNDARY
BUXTON ROAD
PATTON ROAD
MCDONALD CREEK
HUNTSVILLE SPRING BRANCH
REDSTONE ARSENAL BOUNDARY
REDSTONE ROAD
LINDALE CREEK
BUXTON ROAD
TRIANA
TENNESSEE RIVER
TENNESSEE RIVER
1800 FT

FIGURE 4. General Site Map - Huntsville Spring Branch, Indian Creek, and Vicinity

SOURCE: WATER AND AIR RESEARCH, INC., [illegible]

U.S. ARMY CORPS OF ENGINEERS, MOBILE DISTRICT
Engineering and Environmental Study of DDT Contamination of Huntsville Spring Branch,
Indian Creek, and Adjacent Lands and Waters, Wheeler Reservoir, Alabama

APPENDIX B

REVIEW PANEL MEMBERSHIP

REVIEW PANEL MEMBERSHIP

Review Panel Chairmanship

Mr. Howard D. Zeller
Chairman, Review Panel
Environmental Protection Agency
345 Courtland Street, NE.
Atlanta, Georgia 30365

Phone: (404) 656-2795

Period of Review Panel Service - June 14, 1983 to present

Mr. Zeller is the Chairman of the Review Panel and the United States' designated Program Coordinator for the implementation of the Consent Decree in U.S. v Olin Corporation. Mr. Zeller was the Assistant Regional Administrator for Policy and Management for the United States Environmental Protection Agency in Atlanta, Georgia until January 1986. He is presently on temporary assignment to the State of Georgia Department of Natural Resources. Mr. Zeller has more than thirty years experience in environmental matters. He joined EPA in 1967 as the water quality standards coordinator. He served in several progressively responsible positions and as the Director of the Enforcement Division, he became involved with the initiation and resolution of the litigation that led to the Consent Decree in U.S. v Olin Corporation, and the establishment of the Review Panel. Mr. Zeller has a Bachelor of Science Degree in Biology and Chemistry from the University of Nebraska and a Master of Science Degree in Zoology from the University of Missouri.

REVIEW PANEL MEMBERSHIP (Continued)

Members

Environmental Protection Agency

Dr. Edward S. Bender
U.S. Environmental Protection Agency
401 M Street, SW.
Washington, DC 20460

Phone: (202) 475-8331
FTS 475-8331

Period of Review Panel Service - June 14, 1983 to present

Dr. Bender is an aquatic biologist with the United States Environmental Protection Agency in Washington, DC. He chairs the Technical Committee which provides advice and support for Review Panel activities. In 1977, while working for the U.S. Army, Dr. Bender became involved with DDT sampling at Redstone Arsenal. He joined EPA in 1979 and served as the technical coordinator for the litigation which led to the Consent Decree in U.S. v Olin Corporation, and the establishment of the Review Panel. Dr. Bender has more than fifteen years experience in environmental monitoring, aquatic ecology and toxicology. His dissertation, entitled "Recovery of a Macroinvertebrate Community from Chronic DDT Contamination," studied the toxic effects of DDT runoff from an abandoned manufacturing facility on fish and aquatic invertebrates in a south-central Arkansas stream. Dr. Bender has a Bachelor of Science Degree in Biology from Westminster College, a Master of Science Degree in Zoology from the University of Florida, and a Doctorate in Biology from the Virginia Polytechnic Institute and State University.

REVIEW PANEL MEMBERSHIP (Continued)

Tennessee Valley Authority

Mr. Bruce A. Brye
Environmental Engineer
Tennessee Valley Authority
Room 248, 401 Building
Chattanooga, Tennessee 37401

Phone: (615) 751-7297

Period of Review Panel Service - June 14, 1983 to present

Mr. Brye is a staff Environmental Engineer in TVA's Division of Air and Water Resources and serves as TVA's senior technical expert on water quality issues. Since 1963, Mr. Brye has been involved in the environmental review, permitting, licensing, and litigation of many major TVA projects. During 1978-1980 Mr. Brye was extensively involved in the data acquisition activities for the DDT studies of the environment in the Huntsville Spring Branch-Indian Creek System. During 1981-1983 he provided assistance to EPA and the Department of Justice in the development and review of technical documents during the negotiations which led to the final consent decree in U.S. v Olin Corporation. Mr. Brye has a Bachelor of Arts in Mathematics from Wartburg College, a Bachelor of Science in Civil Engineering (Sanitary Option) from the University of Iowa, and a Master of Science in Sanitary Engineering from the University of Iowa. He is a registered professional engineer in 14 states including Alabama.

REVIEW PANEL MEMBERSHIP (Continued)

United States Fish and Wildlife Service

Mr. W. Waynon Johnson
Senior Staff Specialist
U.S. Fish and Wildlife Service
Richard B. Russell Building
75 Spring Street, SW.
Atlanta, Georgia 30303

Phone: (404) 221-6343
FTS 242-6343

Period of Review Panel Service - June 14, 1983 to present

Mr. Johnson is the Senior Staff Specialist with the United States Fish and Wildlife Service in Atlanta, Georgia. His responsibilities include the management and coordination of the environmental contaminant operations program in the Southeast. Mr. Johnson's background is in environmental toxicology and physiology in fisheries. He conducted research on environmental contaminants at the Fish and Wildlife National Fisheries Research Laboratory in Columbia, Missouri from 1971 to 1977. In 1978, Mr. Johnson became involved with the investigative efforts by the United States Army relating to the DDT contamination problem in the Huntsville Spring Branch-Indian Creek System. Mr. Johnson has a Bachelor of Science Degree in Biology from Southeastern State University, Durant, Oklahoma, and a Master of Science Degree of Zoology from the University of Oklahoma.

REVIEW PANEL MEMBERSHIP (Continued)

Department of Army

Colonel Dahl J. Cento (Retired)
Deputy Post Commander
DRSMI-XK, Building 112
Redstone Arsenal, Alabama 35898

Period of Review Panel Service - June 14, 1983 to October 30, 1985 (left Review Panel due to retirement from the Army)

Colonel Cento entered the U.S. Army in 1955 and served in progressively responsible positions until his retirement in October 1985. At the time of his retirement he was serving in the dual role as Deputy Post Commander, Redstone Arsenal and Commander, Redstone Arsenal Support Activity. Colonel Cento has a Bachelor of Science Degree in General Studies from St. Louis University and a Masters Degree in Guidance and Counseling from Washington University. He is a graduate of the NATO Defense College, the Armed Forces Staff College, the Field Artillery Officers Advanced Course, and the Officer's Candidate School.

REVIEW PANEL MEMBERSHIP (Continued)

Department of Army (Continued)

Colonel John J. Walker
Deputy Post Commander
AMSMI-DPC, Building 112
Redstone Arsenal, Alabama 35898

Phone: (205) 876-8861
FTS 876-8861

Period of Review Panel Service - November 1, 1985 to present (Note: Colonel Walker has announced retirement from the Army in August 1986.)

Colonel Walker was named as Deputy Post Commander, Redstone Arsenal, in November 1985. His Army career includes tours of duty at Fort Bliss, Texas; Rock Island Arsenal, Illinois; Germany; Vietnam; Korea; and Redstone Arsenal. He served as Professor of Military Science in charge of ROTC at Austin Peay State University in Clarksville, Tennessee, from 1981-1983. He has a Bachelors Degree in Industrial Management from Gannon University, and a Masters Degree in Industrial Management from the American University in Washington, DC.

REVIEW PANEL MEMBERSHIP (Continued)

Alabama Department of Environmental Management

Mr. James W. Warr
Deputy Director
Alabama Department of Environmental Management
1751 Federal Drive
Montgomery, Alabama 36130

Phone: (205) 271-7700

Period of Review Panel Service - June 14, 1983 to present

Mr. Warr is the Deputy Director of the Alabama Department of Environmental Management (ADEM). ADEM, created in August 1982, is responsible for the implementation and consolidation of the State of Alabama's environmental program activities. Mr. Warr was previously the Director of the Alabama Water Improvement Commission (AWIC), which administered the Alabama Water Pollution Control Act. He joined the AWIC in 1968 and has several years of experience and knowledge concerning the environmental conditions in the Wheeler Reservoir, Huntsville Spring Branch-Indian Creek System. Mr. Warr has a Bachelor of Science Degree in Civil Engineering, a Masters Degree in Civil Engineering, and a Master of Business Administration, all from Auburn University. He is a registered Professional Engineer.

REVIEW PANEL MEMBERSHIP (Continued)

Nonvoting Participants

Town of Triana, Alabama

Honorable Clyde Foster
Town of Triana
480 Zierdt Road
Triana, Alabama 35758

Phone: (205) 772-3553 (home)
(205) 544-4927 (work)

Period of Review Panel Service - June 14, 1983 to present

Mr. Foster, formerly the Mayor of the Town of Triana, Alabama, is a prominent community leader. He was instrumental in the restoration of the Town Charter for Triana, originally chartered in 1819, and was appointed Triana Mayor in 1964, serving in that capacity until 1984. He has been a strong community advocate and instrumental in focusing community concerns. His efforts on behalf of the Town of Triana have been successful in improving many areas of community life.

Mayor Foster has been involved with the resolution of the DDT contamination problem in the Huntsville Spring Branch-Indian Creek System for many years. His contributions include effective and successful coordination of the Review Panel activities with the local community. His efforts have resulted in a spirit of cooperation and understanding within the community.

Mayor Foster is currently the Director of the Equal Employment Office at the National Aeronautics and Space Agency, George C. Marshall Space Flight Center in Huntsville, Alabama. He has a Bachelor of Science Degree in Mathematics and Chemistry from Alabama A & M, and has taken graduate courses at that university.

REVIEW PANEL MEMBERSHIP (Continued)

Nonvoting Participants (Continued)

Olin Corporation

Mr. Verrill M. Norwood
Vice President, Environmental Affairs
Olin Chemicals
Post Office Box 248
Charleston, Tennessee 37310

Phone: (615) 336-4395

Period of Review Panel Service - June 14, 1983 to present

Mr. Norwood is Vice-President, Environmental Affairs for Olin Corporation and Olin's designated Program Coordinator for the implementation of the Consent Decree in U.S. v Olin Corporation. He was Olin's primary technical representative in the negotiations of the Consent Decree and has directed the data collection activities and the development and implementation of the environmental remedy in the Huntsville Spring Branch-Indian Creek System. For the past thirteen years he has served in various technical and management positions within the Olin Corporation. Mr. Norwood has a Bachelor of Science Degree in Chemical Engineering from the Massachusetts Institute of Technology and a Master of Science Degree in Chemical and Metallurgical Engineering from the University of Michigan.

APPENDIX C

REVIEW PANEL OPERATING PROCEDURES

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET
ATLANTA, GEORGIA 30365

FEB - 7 1984

MEMORANDUM:

Subject: Memorandum of Agreement - Operating Procedures

To: Review Panel Members
(List attached)

Enclosed for your records is a copy of the Memorandum of Agreement, Review Panel Operating Procedures, signed by all members. Your comments, suggestions and cooperation in reaching agreement on this document are appreciated.

Howard Zeller

HOWARD D. ZELLER
Chairman

Enclosure

ADDRESSEES:

Mr. Howard D. Zeller
Assistant Administrator
for Policy & Management
Environmental Protection Agency
345 Courtland Street, N. E.
Atlanta, Georgia 30365

Dr. Edward S. Bender
U.S. Environmental Protection
Agency
401 M Street, S. W. EN-338
Washington, D. C. 20460

Mr. Bruce A. Brye
Environmental Engineer
Tennessee Valley Authority
Room 248
401 Building
Chattanooga, Tennessee 37401

Mr. W. Waynon Johnson
Senior Staff Specialist
U.S. Fish and Wildlife Service
Richard B. Russell Bldg.
75 Spring Street, S. W.
Atlanta, Georgia 30303

Colonel Dahl J. Cento
Deputy Post Commander
DRSMI-XK, Bldg. 112
Redstone Arsenal, Alabama 35898

Mr. James W. Warr
Interim Deputy Director
Alabama Department of Environmental
Management
State Capitol
Montgomery, Alabama 36130

Honorable Clyde Foster
Mayor Town of Triana
640 Sixth Street
Triana, Alabama 35758

Verrill M. Norwood
Director, Environmental Affairs
Olin Chemicals Group
P. O. Box 248
Charleston, Tennessee 37310

MEMORANDUM OF AGREEMENT

Review Panel Operating Procedures

The Consent Decree filed in U.S. v. Olin Corporation, CIV80-PT5300-NE, U.S. District Court, Northern District of Alabama, on May 31, 1983, called for the establishment of a Review Panel consisting of members from EPA (Chairperson), Tennessee Valley Authority, Fish and Wildlife Service, U.S. Army, Alabama Department of Environmental Management and non-voting participants from the Town of Triana and Olin Corporation. The Review Panel is responsible for establishing the procedural guidelines to be followed in conducting its activities and responsibilities.

The provisions and operating procedures contained in this Memorandum of Agreement are intended solely for the guidance of the Review Panel members and participants. It is not intended to and may not be relied upon to create a right or benefit, substantive or procedural, enforceable at law or in equity by any person.

By signature affixed to this Memorandum of Agreement, the Review Panel adopts the following guidelines and procedures for the conduct of the Review Panel activities and responsibilities. This Memorandum of Agreement may be modified, supplemented or changed by majority vote of the Review Panel.

I. General

1. The Chairperson of the Review Panel will be the United States Program Coordinator and, as such, will be the focal point of communications between the United States and Olin to carry out the terms and conditions of the Consent Decree.

2. Each entity appointing a member or participant to the Review Panel shall be responsible for its own expenses in connection with its respective member's service on the Review Panel.

3. The EPA will provide legal counsel to the Review Panel. However, all members have the opportunity to utilize their own agency legal counsel. The Department of Justice will represent the United States in all matters relating to compliance with the Consent Decree provisions and Review Panel decisions.

4. Freedom of Information Act requests directed to the Review Panel or its member agencies will be responded to by one of the following methods:

a. Except as noted in c below, the Chairperson (EPA) will respond to FOIA requests lodged with the EPA or requests for documents held within the official files of the Review Panel, complying with FOIA and agency regulations and guidelines. The Chairperson will furnish a copy of such FOIA requests and a listing of the documents released to each of the Review Panel members. In addition, the Chairperson will coordinate FOIA requests requiring a joint response from Review Panel member agencies.

b. Except as noted in c below Review Panel member agencies will respond to FOIA requests lodged with the individual agency complying with FOIA and agency regulations and guidelines. Any FOIA response given by a Review Panel member agency will be coordinated with the Chairperson. A copy of the request and a listing of the documents will be submitted for inclusion in the Official File of the Review Panel.

c. The Chairperson, or his designated representative, and agencies will refer to the individual voting members for processing any record which contains information supplied by one or more voting members and to which the supplying voting member has objected to release. Objections to public release of a document will be clearly noted in the cover letter and on the first page of such documents.

5. The Review Panel may, as needed, appoint committees or task groups from its own members or member agencies to perform specified tasks, including but not limited to, providing information, consultation or assistance to the Review Panel. The Review Panel may obtain the services of non Review Panel technical experts within or outside a member Agency to performs tasks in a specialized area and report to the Review Panel.

6. The Chairperson, as Program Coordinator, will be the focal point of communications between the United States and Olin Corporation. However, to facilitate the operation of the Review Panel, members of the Review Panel may communicate directly with the Olin Corporation Program Coordinator, on matters not privileged or exempt from disclosure as necessary, provided a copy of all such communications are

sent to the Official Review Panel File maintained by the Chairperson. Copies of all documents exchanged by the Chairperson, Review Panel members and Olin will be provided to all members of the Review Panel.

7. The Chairperson will be the spokesperson for public statements and news releases regarding the activities and deliberations of the Review Panel. Statements and news releases prepared in advance of release will be coordinated and reviewed by the Review Panel, to the extent possible. If advance coordination and review of statements and news releases are not obtained, all members of the Review Panel will be informed of the release at the earliest possible time.

8. The Review Panel recognizes that Review Panel represented agencies may have knowledge, experience, expertise and capabilities that would be useful to the conduct of studies pursuant to the Joint Technical Proposal to Implement Remedial Activities by Olin Corporation. However, in order to avoid situations in which an organizational conflict of interest or the appearance of an organizational conflict of interest could arise, the Review Panel will follow the following guidelines:

a. Prior to the initiation by Olin of any studies, projects or proposals which involve the provision of services or products by a Review Panel-represented agency, Olin will present to the Review Panel sufficient information regarding the proposed scope of work, the factors suggesting or requiring such involvement and other information desired by the Review Panel, to enable the Review Panel to evaluate the project, the necessity of Government involvement and options thereto, and to explore any potential organizational conflict of interest.

b. A member of the Review Panel who represents an agency that may be involved with Olin in such a proposal may elect not to participate in any discussions and decisions on such projects.

c. The following factors, among others that may become known at a future time, will be considered by the Review Panel in its evaluation of Olin's proposed projects with member agencies. If a member agency has:

(1) a unique capability; or

(2) expertise in an area necessary to an Olin study; or

(3) knowledge and experience that are necessary to an Olin study; or

(4) facilities that are in close proximity to the study area and necessary to an Olin study; or

(5) a combination of any of the above factors that will allow for rapid completion of projects necessary to comply with Olin's schedule.

d. The Review Panel will evaluate the nature of the project, particularly the results expected to be derived from the project. The Review Panel is the entity responsible, under the terms of the Consent Decree, for the ultimate decision on the remedial measures to be implemented by Olin Corporation. Therefore, projects with member agencies which call for answers, conclusions or recommendations which properly fall within the responsibiity and authority of Olin Corporation and the Review Panel, may present the potential for compromise or the appearance of compromise of the integrity of a Review Panel member. The Review Panel will avoid situations which may bias or appear to bias the decision-making ability of its members.

e. The Review Panel will fully evaluate the proposal, considering relevant factors. If the Review Panel determines, in its view, that a significant actual or apparent organizational conflict of interest exists, the Review Panel will initiate appropriate action to expeditiously resolve the matter.

9. Visits to the Redstone Arsenal for the purpose of Review Panel or other DDT-related matters should be coordinated through the Redstone Arsenal Environmental Office. The address, point of contact and telephone number are:

Commander
U.S. Army Missile Command
ATTN: DRSMI-KLC (Mr. Schroder/Mr. Hagler)
Redstone Arsenal, Alabama 35898

Mr. Morris W. (Bill) Schroder; Mr. Ronald Hagler; 205/876-6122 or FTS 876-6122, or Autovon 746-6122. Advance notice should be furnished in writing, giving name, social security number, dates of attendance, security classification, organization and telephone number.

II. Meetings - Decision

1. The Review Panel may hold meetings, both regular and special, at any location of its member agencies, and at any other appropriate site. Regular meetings shall be held semi-annually and special meetings shall be held as appropriate. Regular meetings shall be scheduled by the Chairperson with at least 30 days notice to all members and non-voting participants. Members may request the Chairperson to schedule special meetings, provided at least five work days notice is given to all other members and non-voting participants. Notice of meetings may be by mail or telephone communication. At the discretion of the Review Panel, meetings or portions of meetings may be deliberative sessions of the Review Panel and may be limited to attendance of members. Appropriate news releases regarding scheduled meetings of the Review Panel will be sent to area media in advance of meetings.

2. At least ten days prior to each regular meeting, an agenda will be provided to each representative at the meeting. The Chairperson will provide for the attendance of a recording secretary at Review Panel meetings. Following each regular meeting a Record of Summary of the Review Panel Meeting will be prepared and distributed within ten working days by the Chairperson to each member and non-voting participant. The record will bear in the margin a designation made by the Chairperson of those matters which are subject to a claim of privilege or exemption from release by member agencies. If no response is received by the Chairperson within ten days, the Record or Summary will be deemed final.

3. Each agency providing a member to the Review Panel shall have one vote. The decisions of the Review Panel will be by majority vote. If requested, a minority report will be recognized and included in the record of the vote.

4. The Review Panel recognizes that situations may arise which could result in the possibility of a deadlocked vote. These situations included, but are not limited to:

a. Absence of a member representative at Review Panel meetings;

b. Abstention of a member during votes;

c. Failure of an agency to promptly reappoint a representative to the Review Panel.

To resolve the possibility of deadlocked votes on decisions, the following procedures will be followed:

a. Member agencies may designate an alternate to its Review Panel representative and ensure, to the extent possible, representation of its agency at all meetings;

b. Member agencies may cast a proxy vote or absentee vote on issues by advising the Chairperson in writing of its intention to do so at least three days prior to the vote on the issue. The agency's proxy or absentee vote must be received by the Chairperson by the date of the vote.

c. In the event of absence or abstention of a member agency and if a proxy or absentee vote has not been cast by the agency, the Review Panel Chairperson will cast the deciding vote if the issue presented for decision is a routine matter before the Review Panel. Routine matters before the Review Panel are decisions other than matters relating to the conduct of monitoring studies, technical proposals, substitute fish species, remedial measures, schedules for implementation of measures and monitoring, modifications of schedules or remedial measures, interim goal progress, determination of "Delaying Events," attainment, continued showing of attainment, termination of the Consent Decree, conflict of interest matters, and any other matters determined by the Review Panel to be major items.

d. In the event of failure of an agency to promptly reappoint a representative to the Review Panel, the Review Panel, through the Chairperson, will request such reappointment. If the lack of the reappointment endangers the ability of the Review Panel to proceed in a timely manner on major decisions, the Review Panel may deliberate and determine by unanimous decision whether a vote on the matter should proceed with a tie breaking vote. The tie breaking method shall be determined by the Review Panel. Simultaneously with these deliberations, the Review Panel, through the Chairperson, will request the Department of Justice to petition the senior active judge, U.S. District Court, Northern District of Alabama, for resolution of the matter.

5. On matters presented to the Review Panel for decision, sufficient time, not to exceed thirty days unless a longer time is agreed upon by the Review Panel, shall be provided for each member to obtain policy guidance and/or approval from his/her agency.

6. Over the course of time, issues not requiring a meeting of the Review Panel may arise. In that event, communication by correspondence, telephone, or other means, may be utilized by members to present such issues to all members and to solicit comments. Any action required or permitted to be taken at any meeting of the Review Panel may be taken without a meeting if a consent in writing, setting forth the action taken, shall be signed by all members of the Review Panel entitled to vote with respect to the subject matter and the writing or the writings are filed with the Record of the Review Panel maintained by the Chairperson. Such consent shall have the same force and effect as all other decisions of the Review Panel.

III. Financial Information

1. Each entity providing representation to the Review Panel is responsible for the costs of its member's representation.

2. The Consent Decree, Paragraph 42, provides that Olin shall bear the reasonable expenses incurred by the United States for contracts to monitor Olin's activities, including data collection and analysis, in connection with the Consent Decree. From the effective date of the Consent Decree and until Olin demonstrates continued attainment of the performance standard, Olin shall bear, without its prior approval, such expenses in an amount not to exceed $10,000 per year. Upon request of Olin, the U.S. shall provide a brief description of the work to be performed under contracts entered into pursuant to carrying out these activities and substantiation of expenses. The United States may not carry over unused sums in any subsequent year. Olin shall reimburse such expense in excess of $10,000 per calendar year only if it has given prior approval to such expenditures.

3. The Review Panel, by majority vote, will determine the appropriate expenditure of the $10,000 per year and any other funds requested of Olin. Procedures for procurement of contractors and fiscal administration will be developed by the Chairperson and Olin Corporation and provided to the Review Panel.

IV. Reports

1. The Review Panel will determine the reporting format and due dates for all reporting to be accomplished by Olin Corporation. The Review Panel has adopted the reporting format in use by Olin Corporation on June 14, 1983. Quarterly reporting, with the first report to be submitted by Olin on September 1, 1983, has been adopted by the Review Panel.

2. Olin Corporation will submit copies of all data and reports directly to the Review Panel representatives in the following quantities:

EPA - 6
TVA - 8
F&W - 7
RSA - 5
ADEM - 3
Mayor Foster - 2

3. The Consent Decree, in Paragraphs 32-34, provides procedures for the determination of whether delays or prevention of performance of obligations under the Consent Decree may be classified as "Delaying Events" and therefore excusable. The Review Panel Chairperson will receive any notification of such Delaying Event, along with all required documentation to fully describe the actual or anticipated event. Following the criteria outlined in the Consent Decree, the Review Panel will determine whether the time for Olin's performance should be extended. The Review Panel will document its decisions and provide all necessary information to the Department of Justice (DOJ) for the appropriate filing with the Court. The Review Panel will also assist the DOJ in determinations regarding stipulated penalties, as outlined in Pararaphs 35 through 40 of the Consent Decree.

This Memorandum of Agreement, constituting the Review Panel Operating Procedures, is hereby accepted and adopted by the representatives of the Review Panel member agencies and non-voting participants as shown by the signatures affixed hereto.

Howard Zeller
HOWARD D. ZELLER
Chairman, Review Panel

COLONEL DAHL J. CENTO
Redstone Arsenal, Alabama

Edward S. Bender
DR. EDWARD S. BENDER
EPA - Washington, D. C.

James W. Warr
JAMES W. WARR
Alabama Department of
Environmental Management

BRUCE A. BRYE
Tennessee Valley Authority

Clyde Foster
MAYOR CLYDE FOSTER
Town of Triana, Alabama

W. Waynon Johnson
W. WAYNON JOHNSON
U.S. Fish and Wildlife Service

Verrill M. Norwood Jr
VERRILL M. NORWOOD
Olin Corporation

DATED: JAN 26 1984

APPENDIX D

CHRONOLOGY OF SIGNIFICANT MILESTONES

CHRONOLOGY OF SIGNIFICANT MILESTONES

May 31, 1983	Consent Decree approved by Court.
June 14, 1983	Review Panel established; first meeting held.
January 26, 1984	Review Panel Operating Procedures finalized and adopted.
June 1, 1984	Olin's Remedial Action Plan submitted to Review Panel.
July 14, 1984	Public hearing held at Triana, Alabama, to receive public comments on Olin's Proposed Remedial Action Plan.
August 31, 1984	Review Panel Decision Document issued; approving Olin's remedial action plan, with modifications.
January 2, 1985	Nashville COE initiated scoping request to the public for an EIS on the permit action.
February 5, 1985	Olin submitted draft permit applications to Review Panel and Permitting Agencies.
July 1, 1985	Olin submitted final engineering drawings and specifications, and environmental analysis report.
July 1, 1985	Olin submitted Section 10/404 and Section 26a permit applications to Nashville COE and TVA, respectively; submitted formal request for right-of-way permit to FWS.
July 1, 1985	Olin submitted Report on Field and Laboratory Investigations of the Huntsville Spring Branch-Indian Creek (HSB-IC) System.
July 17, 1985	Nashville COE issued notice of the availability of the draft EIS for the Section 10/404, 26a, and right-of-way permitting actions.

CHRONOLOGY OF SIGNIFICANT MILESTONES (Continued)

August 1, 1985	Olin submitted remedial action alternatives report for Lower Reach A.
August 1, 1985	Olin submitted interim goals report.
December 2, 1985	U.S. Army issued license to Olin for remedial action construction activities on Redstone Arsenal property.
January 15, 1986	Olin submitted revised section 10/404/26a and right of way permit applications and detailed engineering plans to Review Panel, Nashville COE, TVA, and FWS.
January 28, 1986	FWS issued limited authorization for the initiation of site preparation and mobilization activities within the boundaries of the Wheeler National Wildlife Refuge.
February 21, 1986	Final EIS issued by Nashville COE.
March 1, 1986	Olin submitted the following special reports: "Baseline Data for Water and Fish Substitute Fish Species; Long-Term Data Acquisition Program (Revised); and Interim Goals.
March 24, 1986	Close of public comment period on final environmental impact statement.
March 25, 1986	Alabama Department of Environmental Management issued section 401 certification for the remedial action.
March 31, 1986	Permits issued to Olin for remedial action Section 10/404 - Nashville COE Section 26a - TVA
April 1, 1986	Right-of-Way Permit issued by FWS.

CHRONOLOGY OF SIGNIFICANT MILESTONES

May 31, 1983	Consent Decree approved by Court.
June 14, 1983	Review Panel established; first meeting held.
January 26, 1984	Review Panel Operating Procedures finalized and adopted.
June 1, 1984	Olin's Remedial Action Plan submitted to Review Panel.
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July 17, 1985	Nashville COE issued notice of the availability of the draft EIS for the Section 10/404, 26a, and right-of-way permitting actions.

CHRONOLOGY OF SIGNIFICANT MILESTONES (Continued)

August 1, 1985	Olin submitted remedial action alternatives report for Lower Reach A.
August 1, 1985	Olin submitted interim goals report.
December 2, 1985	U.S. Army issued license to Olin for remedial action construction activities on Redstone Arsenal property.
January 15, 1986	Olin submitted revised section 10/404/26a and right of way permit applications and detailed engineering plans to Review Panel, Nashville COE, TVA, and FWS.
January 28, 1986	FWS issued limited authorization for the initiation of site preparation and mobilization activities within the boundaries of the Wheeler National Wildlife Refuge.
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March 24, 1986	Close of public comment period on final environmental impact statement.
March 25, 1986	Alabama Department of Environmental Management issued section 401 certification for the remedial action.
March 31, 1986	Permits issued to Olin for remedial action Section 10/404 - Nashville COE Section 26a - TVA
April 1, 1986	Right-of-Way Permit issued by FWS.

CHRONOLOGY OF SIGNIFICANT MILESTONES (Continued)

April 1, 1986	Initiation of construction of remedial action in Upper Reach A.
April 23, 1986	Official groundbreaking ceremony for remedial action construction activities in Upper Reach A.

APPENDIX E

REVIEW PANEL DECISION DOCUMENT

August 31, 1984

DECISION DOCUMENT

OLIN CORPORATION REMEDIAL PLAN TO ISOLATE DDT FROM PEOPLE AND THE ENVIRONMENT IN HUNTSVILLE SPRING BRANCH - INDIAN CREEK SYSTEM

I. Introduction

On May 31, 1983, the United States District Court for the Northern District of Alabama (Northeastern Division - the Honorable Robert B. Propst) entered, as part of an overall order settling litigation between the United States of America, the State of Alabama, and four sets of private parties against the Olin Corporation, a Consent Decree that governs the development and implementation of remedial action for the DDT contamination in the Huntsville Spring Branch - Indian Creek (HSB-IC) System. (Figure 1) The Consent Decree requires the Olin Corporation to develop and implement a remedial plan that will meet a performance standard of 5 parts per million (ppm) of DDT in fillets of channel catfish, largemouth bass, and smallmouth buffalo in specified reaches of the HSB-IC System consistent with the goals and objectives of the Decree. Those Reaches are:

A - HSB Mile 5.4 to 2.4
B - HSB Mile 2.4 to 0.0
C - IC Mile 5.6 to 0.0

The Olin Corporation proposed remedial plan, monitoring program, and construction and implementation schedule were submitted on June 1, 1984, as required by the Consent Decree.

A Review Panel, consisting of members from the United States Environmental Protection Agency, Tennessee Valley Authority, United States Fish and Wildlife Service, the Department of the Army, the State of Alabama, and nonvoting participants from the Town of Triana, Alabama, and the Olin Corporation, was established by the Consent Decree. The Review Panel responsibilities include taking action on the Olin proposal to approve it, disapprove it, or designate a substitute remedy. If, during or following implementation of the remedy, the Review Panel determines that modifications are necessary to meet the 5 ppm performance standard established in the Consent Decree, the Review Panel may require such modifications.

Additional detailed information on the environmental aspects of this remedy will be developed through the permitting and environmental review processes of the appropriate federal and state agencies. If appropriate, the remedy will be reevaluated by the Review Panel in light of the additional environmental information.

This document sets out the Review Panel decision. Nothing in this Decision Document is intended to modify the terms of the Consent Decree and in the event of any inconsistencies between this Decision Document and the Consent Decree, the provisions of the Consent Decree will govern.

II. Decision

The decision of the Review Panel is to accept, with modifications, terms and conditions, and a schedule, the Olin Corporation proposal as supplemented by the August 13, 1984, letter from Olin Corporation to the Review Panel Chairman (Appendix 1).

The Review Panel accepts Olin Corporation's basic proposal to isolate the bulk of the DDT-contaminated sediments in place by the following actions:

> Olin Corporation will bypass and bury in place the most heavily contaminated channel area (HSBM 5.4 to 4.0). Implementation of the proposed remedial plan will take place in areas totally within the boundaries of the Redstone Arsenal (RSA) and Wheeler National Wildlife Refuge. Figure 2 depicts the particulars of the remedial plan for this portion of Reach A.
>
> The HSB will be rerouted from above where the former wastewater ditch from the former DDT manufacturing plant enters the channel at HSBM 5.4 to where the large embayment west of the Loop enters the main channel below HSBM 4.0. A new channel will be cut from the west end of the Loop through the salient to the existing shallow ponds and marshy areas of the embayment located south of the present channel. The flow will reenter the HSB below HSBM 4.0. Blocking dams will be constructed at HSBM 5.57 and 4.0 and at the west end of the Loop.
>
> The existing channel, after isolation, will be filled with clean material which will be imported to the site. An additional dam will be installed at HSBM 4.2 to provide a settling basin for water discharged from the existing channel during filling.
>
> To minimize water collection in the fill area, the former wastewater ditch from the manufacturing site will be diverted to a point upstream from the dam at HSBM 5.57, and a rainfall runoff diversion ditch will be installed across the north of the isolated HSB channel from approximately HSBM 5.0 to HSBM 4.0. This ditch will divert local runoff, which would normally enter the HSB system from the north side of the project area, to below HSBM 4.0.
>
> Olin will isolate at least 95% of the DDT estimated to occur between HSBM 5.4 and HSBM 4.0. Olin will isolate and bury the highly contaminated portions of the overbank adjacent to the part of the channel to be filled.

The Review Panel also accepts the Olin Corporation proposal to continue laboratory studies addressing sediment and diet uptake, the instream cage study, and the fish sampling program. In addition, the Review Panel accepts the Olin Corporation proposal as supplemented by the August 13, 1984, letter to the Review Panel Chairman for time-of-travel studies and the water sampling program.

The Review Panel requires the following modifications to the remedial plan submitted by Olin Corporation:

1. Olin shall submit a plan for removal and/or isolation of DDT contaminated sediments in Reach A between HSBM 4.0 and 2.4. The plan shall estimate the quantity of DDT that would be removed or isolated and the effect of such actions on the concentration of DDT in the water column, sediment transport, environmental impacts, and attainment of the performance standard.

2. Olin shall perform a study further identifying the extent of DDT contamination in Reaches B and C.

3. Olin Corporation shall propose interim goals for DDT concentrations in fish, suspended sediment, and the water column for the years 2, 4, 6, and 8 following completion of the remedial action. Olin Corporation shall submit such goals and the basis for these goals to the Review Panel by August 1, 1985.

The decision of the Review Panel includes the following terms and conditions:

1. As additional information becomes available or the state-of-the-art advances, further remedial actions and monitoring in one or more Reaches may be agreed to by the Olin Corporation and the Review Panel or required by the Review Panel to improve the effectiveness of the remedial action plan. Additionally, the Review Panel may direct modifications to the remedy if it becomes apparent that the remedial action is not adequate to meet the performance standard consistent with the goals and objectives of the Consent Decree.

2. Approval of the Olin Corporation remedial action plan, as modified by this decision, is limited to the conceptual approach discussed above and the time schedule set out below. The monitoring program will be further defined and submitted in accordance with the schedule below. The specific actions necessary to implement the modified remedial action plan require further development (e.g., applications to and negotiations with appropriate federal and state agencies on necessary permits, and resolving issues of support from and access to Redstone Arsenal) and are not addressed in this decision.

The following schedule shall be met by the Olin Corporation:

February 1, 1985	Submission of detailed monitoring plan
April 1, 1985	Submission of preliminary engineering
July 1, 1985	Submission of final engineering and design specifications
July 1, 1985	Submission of results of laboratory studies, time-of-travel studies, in-stream cage studies, fish sampling program, and water sampling program
July 1, 1985	Submission of detailed environmental analysis for necessary permits
July 1, 1985	Submission of necessary permit applications
August 1, 1985	Submission of plans for additional remedial actions in Reach A*
August 1, 1985	Submission of interim goals and basis
September 1, 1986	Submission of studies further identifying the extent of DDT in Reaches B and C

*Dates for submission of engineering and design specifications, environmental analyses, and permit applications will be developed.

Additional dates for action will be specified upon issuance of necessary permits for which dates cannot be fixed at this time. However, construction should be completed within 3 years after issuance of necessary permits.

III. Decision Considerations

After careful consideration by Review Panel members of the provisions of the Consent Decree relative to this decision, the features of the plan, the environmental consequences, the alternatives, and the comments submitted by the public, the Review Panel accepts the remedial plan, as modified, as an appropriate action toward achieving the required performance standard of 5 parts per million of DDT in fillets of specified fish species in the HSB-IC System, consistent with the goals and objectives of the Consent Decree.

A. Consent Decree Provisions:

1. Performance standard: The Olin remedial plan for the DDT contamination in HSB-IC shall achieve a performance standard of 5 ppm of DDT in fillets in channel catfish, largemouth bass, and smallmouth buffalo in Reachs A, B, and C of the HSB-IC System.

2. Goals and Objectives:

   a. Isolate DDT from people and the environment in order to prevent further exposure;

   b. Minimize further transport of DDT out of the HSB-IC System;

   c. Minimize adverse environmental impact of remedial actions;

   d. Mitigate effect of DDT on wildlife habitats in the Wheeler National Wildlife Refuge;

   e. Minimize adverse effects on operations at RSA, Wheeler Reservoir, and Wheeler National Wildlife Refuge;

   f. No increase in flooding, particularly at City of Huntsville and RSA, except those increases in water level which can be reasonably expected in connection with the implementation of remedial action, provided Olin takes all reasonable steps to minimize or prevent such increases; and

   g. Minimize effect of loss of storage capacity for power generation, in accordance with the Tennessee Valley Authority Act ("TVA Act").

3. Factors to be Considered by the Review Panel:

   a. The nature of the endangerment to human health and the environment which the remedial action is designed to address;

   b. The extent to which implementation of the remedial action would reduce or increase endangerment to human health or the environment;

   c. Whether implementation of such remedies is unnecessary to satisfy or is inconsistent with the Goals and Objectives set forth in the Consent Decree and the performance standard; and

   d. Whether the remedy chosen is the most cost-effective means of accomplishing the performance standard.

4. Effect of Other Laws

The Consent Decree requires that all work undertaken pursuant to the Decree is to be performed in accordance with all applicable federal, state, and local statutes, regulations, ordinances, and permits.

B. Features of the Modified Remedial Action

The Review Panel and supporting technical staff have reviewed extensive study plans and data from the Olin Corporation and other sources. It is clear that some affirmative remedial actions must be taken to isolate DDT from people and the environment and to meet the performance standard, consistent with the goals and objectives of the Consent Decree. It is equally clear that the complex issues raised by this DDT contamination cannot be resolved simply nor can success be guaranteed prior to implementation. The following features of the remedial plan, as modified, have been considered by the Review Panel:

1. It isolates the major source of DDT in the HSB-IC system.
2. It reduces the transport of DDT in water and sediment, thus reducing overall DDT exposure to humans and the environment.
3. It minimizes the resuspension and movement of DDT contaminated sediments.
4. It is a feasible remedial measure that can be implemented in a relatively short time.
5. It does not adversely affect groundwater.
6. It allows for identification and evaluation of remaining sources of DDT-contamination.
7. It does not preclude the implementation of further actions if deemed necessary.
8. It requires a long term commitment for monitoring and maintenance.

C. Environmental Consequences

The remedial action will involve channel widening, channel deepening, channel creation, access road construction, stormwater diversion, and channel filling. Some unavoidable but temporary adverse environmental impacts will occur as a result of construction. Some DDT will not be isolated and will remain in portions of the channels and wetlands in Wheeler National Wildlife Refuge. The effect of this DDT on people and the environment is not fully discernible at this time. However, the remedial plan, as modified, is believed to be an appropriate action toward achieving the performance standard consistent with the goals and objectives of the Consent Decree.

Construction activities will temporarily reduce water quality through increased turbidity and suspended solids. Some DDT contaminated sediment may be resuspended and transported downstream. Groundwater is not expected to be adversely impacted because of the low solubility of DDT in water, the strong association of DDT with particulates and the limited mobility of particulates in groundwater. Benthic, aquatic, and terrestrial habitat will be altered or destroyed but new habitat will be naturally established. Fish and wildlife will be temporarily disturbed but will ultimately have a less contaminated habitat.

Some wetlands will be destroyed or modified. Alterations in floodplain hydrology may cause changes in wetland vegetative communities. The flow regime in some portions of the HSB will be altered, and flood patterns of the immediate overbank area may change. The overall flood storage capacity is not expected to be significantly altered.

No changes in land uses are expected, with the possible exception of effects on activities on Redstone Arsenal that are acceptable and approved by the Army. At this time, no significant impacts are anticipated to area residents, cultural resources, or endangered, threatened, or special concern biota. No significant air or noise impacts are anticipated. A more detailed identification of environmental consequences is provided in Appendix 2.

The Olin Corporation will submit additional environmental analyses and information prior to construction as required in connection with securing the specific approvals and permits of various agencies. These analyses will address the effects from the specific engineering and design specifications submitted by the Olin Corporation.

D. Alternatives

Various remedial approaches and specific alternatives have been developed by the the Olin Corporation in the remedial action plan and by Water and Air Research, Inc. (W.A.R.) in a 1980 report. The various approaches for remedial action either isolate the DDT, remove the DDT, or destroy the DDT. Several generic approaches have been considered, including, in-place isolation, dredging and off-site transport, low-level dams, channel rerouting, biological management, out-of-basin diversion, destruction, and natural restoration (no action). In-place isolation and channel rerouting were selected for further evaluation.

Dredging and off-site transport could remove much of the DDT from the HSB-IC System. However, dredging could cause suspension and redistribution of DDT downstream, potentially causing increased contamination of fish, people, and the environment. Dredging would result in significant destruction of benthic, aquatic, and wetland habitat. Transporting this quantity of material would present considerable problems. The nearest permitted hazardous waste landfill is approximately 170 miles away, and the effect on local traffic and roads would be adverse. The combination of these environmental consequences indicates this alternative is not in the best interest of the public.

Low-level dams were found to be insufficient to attain the performance standard. Biological management would have severe adverse effects and would not meet the performance standard. Out-of-basin diversion would have extensive adverse environmental consequences. Destruction was found to be infeasible. Natural restoration would not meet the performance standard. Additional discussion of the alternatives can be found in Appendix 3.

Three specific alternatives were developed from the in-place isolation and channel rerouting approaches:

(1) channel rerouting only by blocking the existing flow channel from HSBM 5.4 to 4.0 and constructing a new channel from the Loop to the embayment area, with flows reentering the HSB just downstream from HSBM 4.0;
(2) channel rerouting as above with the addition of filling in the old channel after isolation; and
(3) covering the existing contaminated sediment between HSBM 5.4 and 4.0 and allowing HSB to find its own channel (no new channel would be constructed).

Alternative (2) was proposed by the Olin Corporation as the most appropriate method to meet the performance standard consistent with the goals and objectives of the Consent Decree. Actions for HSBM 4.0 to 2.4 are to be developed by the Olin Corporation for submittal to the Review Panel.

E. Public Comments and Responses

The comments received from the public relative to the Olin Corporation remedial plan have been considered and are summarized and responded to in Appendix 4.

IV. Conclusion

This Decision Document comprises the decision and Appendices 1-6, which are attached hereto and are incorporated herein.

This Decision is accepted and adopted by the representatives of the Review Panel member agencies and concurred in by the nonvoting participants as shown by the signatures affixed hereto.

MEMBERS

Howard Zeller
HOWARD D. ZELLER
Chairman, Review Panel

W. Waynon Johnson
W. WAYNON JOHNSON
U. S. Fish and Wildlife Service

Edward S. Bender
DR. EDWARD S. BENDER
EPA - Washington, D.C.

COLONEL DAHL J. CENTO
U. S. Army, Redstone Arsenal

Bruce A. Brye
BRUCE A. BRYE
Tennessee Valley Authority

James W. Warr
JAMES W. WARR
Alabama Department of
Environmental Management

NONVOTING PARTICIPANTS

Clyde Foster
MAYOR CLYDE FOSTER
Town of Triana, Alabama

Verrill M Norwood
VERRILL M. NORWOOD
Olin Corporation

DATED: August 31, 1984

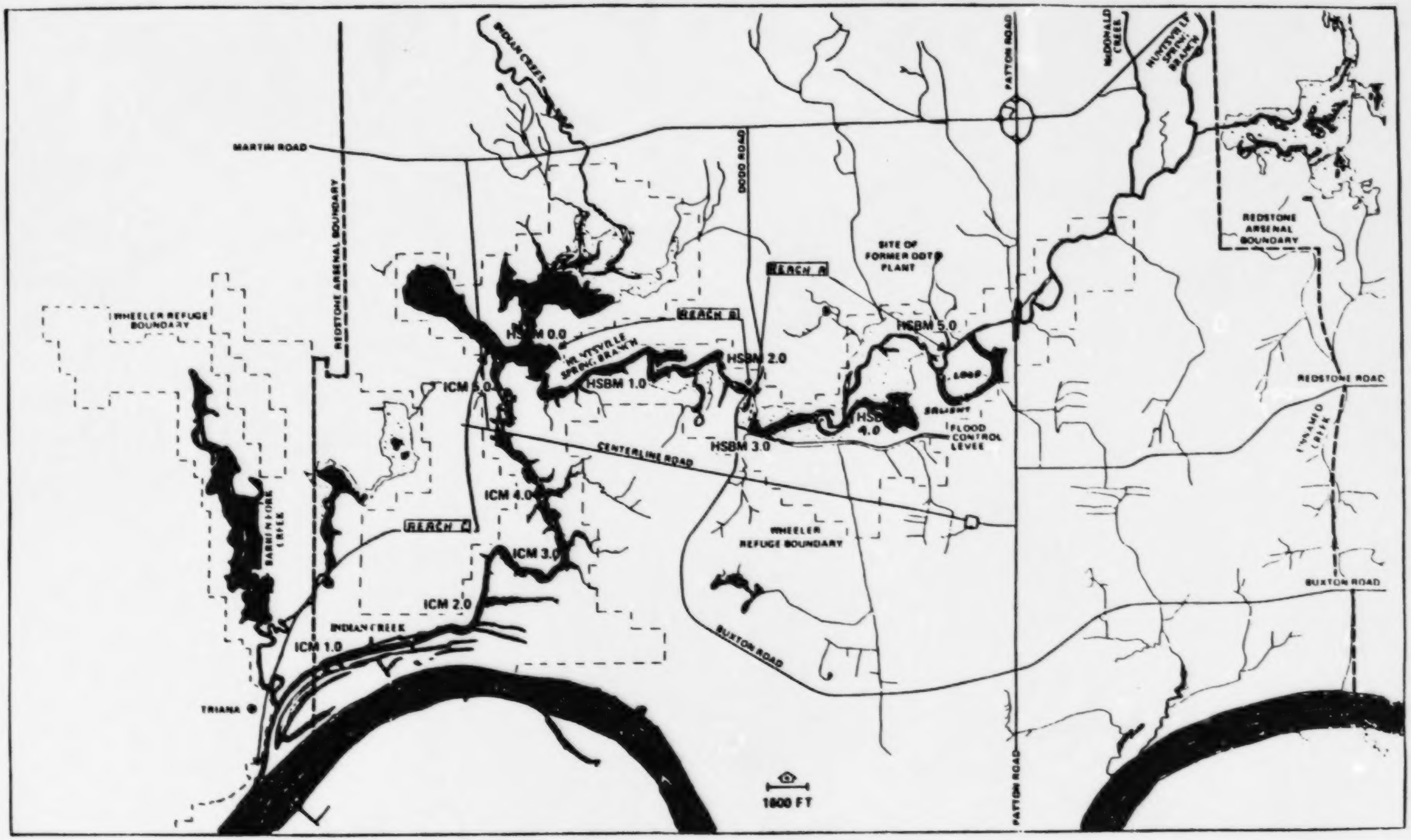
MARTIN ROAD
INDIAN CREEK
REDSTONE ARSENAL BOUNDARY
WHEELER REFUGE BOUNDARY
REACH B
REACH A
DODD ROAD
SITE OF FORMER DDT PLANT
PATTON ROAD
McDONALD CREEK
HUNTSVILLE SPRING BRANCH
REDSTONE ARSENAL BOUNDARY
HSBM 0.0
HUNTSVILLE SPRING BRANCH
HSBM 1.0
HSBM 2.0
HSBM 5.0
LOOP
SALIENT
HSBM 4.0
FLOOD CONTROL LEVEE
HSBM 3.0
CENTERLINE ROAD
REDSTONE ROAD
FIVEMILE CREEK
ICM 5.0
ICM 4.0
REACH C
ICM 3.0
ICM 2.0
INDIAN CREEK
ICM 1.0
BARREN FORK CREEK
TRIANA
WHEELER REFUGE BOUNDARY
BUXTON ROAD
BUXTON ROAD
1600 FT
PATTON ROAD

FIGURE 1. GENERAL SITE MAP - HUNTSVILLE SPRING BRANCH-INDIAN CREEK SYSTEM

REACH A = HSBM 5.4 to HSBM 2.4
REACH B = HSBM 2.4 to HSBM 0.0
REACH C = ICM 5.6 to ICM 0.0

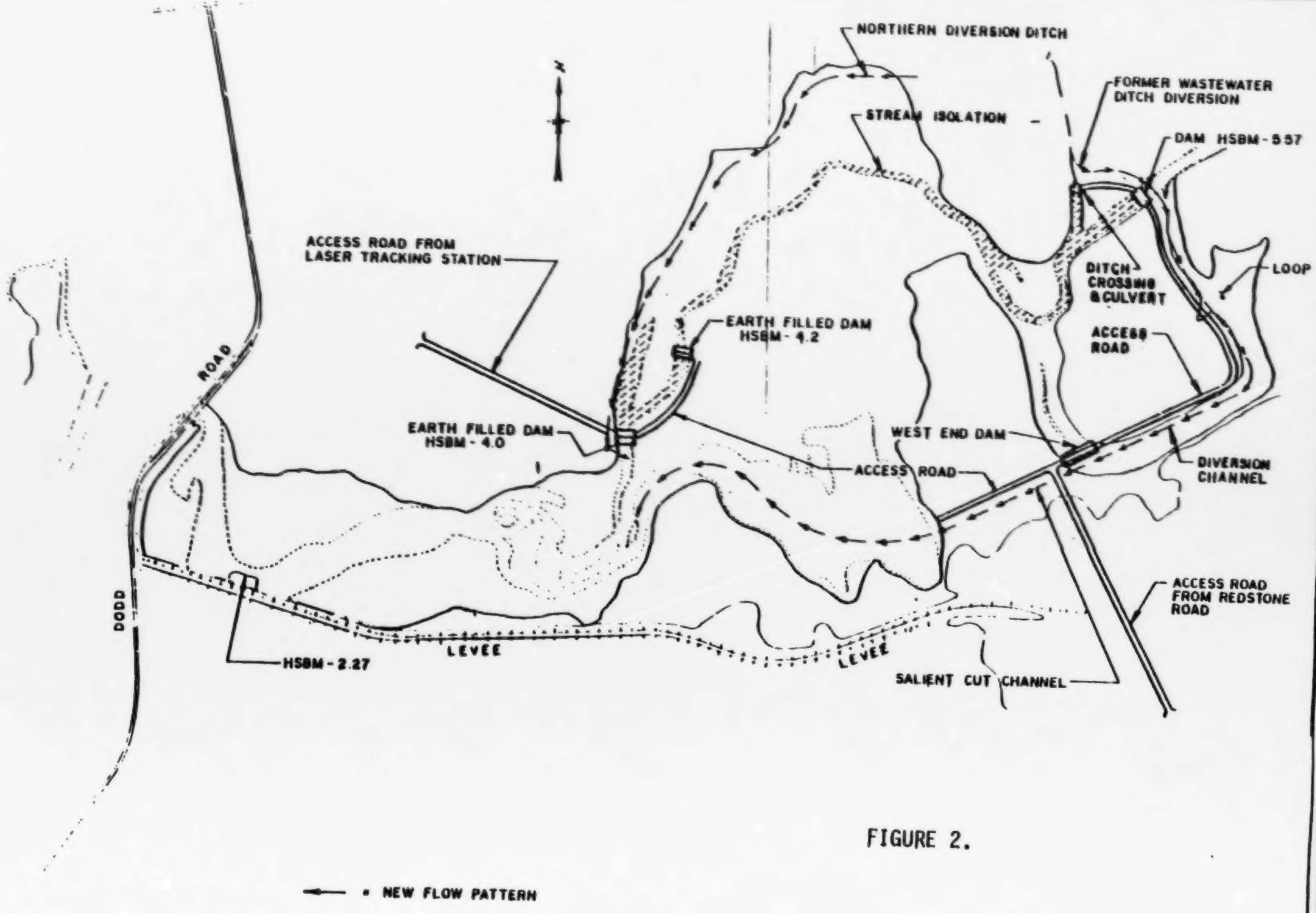
NORTHERN DIVERSION DITCH
STREAM ISOLATION
FORMER WASTEWATER DITCH DIVERSION
DAM HSBM - 5.57
N
ACCESS ROAD FROM LASER TRACKING STATION
DITCH CROSSING & CULVERT
LOOP
EARTH FILLED DAM HSBM - 4.2
ACCESS ROAD
ROAD
EARTH FILLED DAM HSBM - 4.0
WEST END DAM
ACCESS ROAD
DIVERSION CHANNEL
ACCESS ROAD FROM REDSTONE ROAD
DODD
HSBM - 2.27
LEVEE
LEVEE
SALIENT CUT CHANNEL
← = NEW FLOW PATTERN

FIGURE 2.

APPENDIX I

Olin CHEMICALS GROUP
120 LONG RIDGE RD., STAMFORD, CONN. 06904

August 13, 1984

Mr. Howard Zeller
Chairman Review Panel
Environmental Agency
345 Courtland St. N.E.
Atlanta, GA 30365

Dear Mr. Zeller:

Pursuant to requests made at the Review Panel meeting on August 7, 1984, we are pleased to submit the following supplemental information to our Remedial Action Plan submitted on June 1, 1984.

After careful review and study of our Remedial Action Plan, we have concluded that additional DDT can and will be isolated in the Plan area, i.e. HSBM 5.4 to 4.0. The tons of DDT involved are:

	DDT isolated, tons	
	Initial	Revised
Channel	286	288
Overbank	0	20.0
Ponded	0	0.2

Approximately nine (9) tons of DDT will remain in the overbank area. This area covers 180 acres. Of the nine (9) tons, approximately 4½ tons are in the 0-3 inch depth fraction. Thus, about 4½ tons of DDT in 180 acres will be potentially available in the overbank area. This overbank area is not very conducive to erosion and little, if any, DDT will be released from the area during the few days in a year (18 in 1983) when the overbank area is covered with water. More than 95% of the DDT in the remedial action area - HSBM 5.4 to 4.0 - is being addressed by our plan.

Additional or on-going laboratory and field studies were addressed in Section IX of the June 1, 1984 Proposal. These studies have been discussed in Quarterly Reports, Technical meetings, and Review Panel meetings as well. These studies include sediment uptake, diet uptake, and in-stream cage studies as well as a consistent-effort fish sampling program. Per the June 1 Proposal the schedule for this latter program is to start in Summer 1984 and continue for 12 months. Additional schedule information is as follows:

In situ cage studies	Complete 6/85
Time-of-travel studies	Complete 3/85
Water sampling	Weekly until 4/85
Sediment studies	Complete 6/85
Diet studies	Complete 6/85

OLIN CORPORATION

The dates stated are, of course, based upon what we know at the present time. Studies may be shortened or lengthened depending upon test results obtained.

The engineering schedule as best we knew it at the time of plan submission was presented as Figure VII - 2A. It indicated engineering would occur 11/84 to 7/85, during which time we would expect to generate material for review and approval. Since June 1, 1984 we have been selecting and interviewing engineering firms qualified to do the detailed engineering. We have selected four (4) firms and plan to begin on-site interviews the week of August 13th. Our present plan, contingent upon the Review Panel approving our plan on September 1st, is to place an engineering contract by October 1st. By November 30th we would expect to have a detailed schedule so we could inform Review Panel members when specific documents will be available for review. The Consent Decree recognized that detailed engineering could not proceed until after Plan approval. As such we were unable to submit detailed time schedules with our Plan. Beyond the dates on Figure VII - 2A we have developed, per Panel request, a rough estimate of activities as follows:

o Site surveys	November - December 1984
o Preliminary Engineering	January - March 1985
o Preparation of Plans & Specs	April - September 1985
o Salient cut	April 1985
o Flow Division	May 1985
o Roads, Diversion ditch	May - July 1985
o Channel fill	June - July 1985
o Permits	February - November 1985

The long-term monitoring plan was addressed in the June 1, 1984 Remedial Action Plan in Section VIII. The plan was briefly discussed at the Technical Meeting on August 6th. It was agreed that after September 1, 1984 we would cooperatively develop further details of the long-term monitoring program. The comments on our plan from Review Panel members did contain two (2) questions/comments relative to the Section VIII program. Both were answered in our submission of July 14, 1984.

The monitoring plan will be used after October 1987 when the diversion portion of the Plan is scheduled to be completed and after November 1988 when the channel filling operation is scheduled to be completed. We, therefore, do have adequate time to address the long-term monitoring plan and develop it in view of all the test data we have and are continuing to obtain. As discussed at the Technical and Review Panel meetings on August 6 and 7, however, we believe we should give high importance to the development of this program and we agreed to submit the plan with more details by November 1, 1984. The schedule after that is dependent upon the time required for comments, discussion, change, etc. We do have time to develop a program because it is not needed until October 1987.

We believe the above answers the several concerns expressed by the Review Panel at the August 7, 1984 meeting.

Very truly yours,
Verrill M. Norwood
Verrill M. Norwood
Vice President
Environmental Affairs

cc: Review Panel

APPENDIX 2

Environmental Consequences of The Remedial Action Plan

The environmental consequences of the Olin Corporation remedial action plan are described below. They are not specifically quantified, because detailed plans and specifications will not be completed until July 1, 1985. These plans and specifications will be subject to review and approval by the Review Panel. The Olin Corporation will be required to prepare site-specific environmental analyses as part of the required permit applications.

The existing state of the environment in the HSB-IC System is a significant factor in determining the appropriateness of a remedial action. It is important to avoid aggravating the existing environment while implementing the remedial action.

Water Quality and Quantity

Construction activities will cause temporary adverse effects on water quality by increasing turbidity and suspended solids. Some erosion may occur until restabilization is completed. The planned sequence for construction of the dams and diversion channel and for isolation and filling of the old channel should minimize the potential for suspension and transport downstream of DDT contaminated sediment.

Once the filled isolated channel and the overbank area have been stabilized, the potential for future scouring of DDT contaminated sediment is expected to be significantly reduced. No significant changes in sediment erosion are anticipated in Reaches B and C, because the Wheeler Reservoir backwater level, which is the major hydrologic control, and the Dodd Road bridge, which also controls flow, will not be affected by the remedial action. Uncontaminated sediment from upstream will continue to be carried downstream and be deposited over contaminated sediment. As the major source of DDT is isolated, concentrations in the water column will decrease.

There should be only minor changes in the water level of Reach A after completion of the remedial action. The level is determined by the level of Wheeler Reservoir during lower flows and reservoir backwater floods. The level is controlled by the channel constriction at HSBM 2.72 and the Dodd Road bridge during headwater floods at low reservoir pool levels. Since no permanent changes will occur to the operation of Wheeler Reservoir or to the Dodd Road bridge from the remedial actions, no significant upstream water level changes are expected.

The normal HSB channel between HSBM 5.6 and 4.0 is 50-100 feet wide with numerous blockages by sand bars and fallen trees. The diversion channel will be at least 80 feet wide and will have no blockages. Thus, the potential for additional flooding upstream from this area will be minimized.

The new channel to be cut through the salient will be able to handle higher flows than the original channel. The flows from the cut will be routed through the embayment. The flow characteristics through the embayment are being defined and these characteristics will be considered in the engineering design to minimize scouring and downstream transport of DDT contaminated sediment.

Periodic flooding will continue to occur in Reach A as a result of Wheeler Reservoir backwater flooding and during headwater storm events. All dams and the channel stabilization will be designed to withstand repeated flooding. The remedial action is not expected to create any additional ponded areas with elevated DDT concentrations.

The rerouting of HSB in conjunction with future actions in lower Reach A is not expected to change the flow regime downstream from HSBM 2.4. The planned diversion of the Huntsville wastewater treatment plant effluent to the Tennessee River will reduce water flow in the HSB by some 30 million gallons per day. The removal of this effluent will improve the existing low dissolved oxygen problem in the HSB System and will permit additional fish to move further upstream. The decreased flow will have minimal effect on the planned remedial action because water levels are controlled by the level in Wheeler Reservoir.

Aquatic Ecology

The existing benthic habitat in the old channel will be destroyed when it is isolated and filled. Excavation of the Loop area will also destroy existing benthic habitat. Clearing and grubbing will remove natural snags that serve as habitat for existing aquatic invertebrates and provide shelter for fish. The aquatic communities will recover over a period of time; however, the loss of snags and the unique habitats they provide will represent a long-term loss. The new diversion channel will be clear of obstructions that would provide desirable habitat.

Fish will likely move out of the area during construction activities. Once construction has been completed, fish will return but will find less available food. However, the sediment in the Loop and new diversion channel are expected to be relatively free of residual DDT.

The majority of the area is composed of various types of wetlands ranging from standing water marshes to seasonally inundated forested sites. Approximately 55 acres will be impacted directly by construction activities. The proposed diversion channel along with the planned northern rainfall collection ditch will alter the hydrology at the site and may detrimentally affect some of the remaining wetlands. Some wetland areas may receive less water from overbank flooding and runoff waters, resulting in a change to more upland types of vegetative communities. The overall flood storage capacity of this area is not expected to be altered significantly.

Terrestrial Ecology

Existing terrestrial vegetation will be destroyed during construction activities. Less food and habitat will be available to the wildlife in the area. Areas will be revegetated to reestablish habitat after completion of construction.

At this time, no significant impacts to endangered, threatened, or special concern biota are expected within the immediate area planned for remedial action. Two alligators have been sighted downstream at HSBM 2.72 and 2.2, but alligators would probably avoid the area during construction.

Groundwater

The potential for subsurface migration of DDT either laterally or vertically is extremely low because of the low permeability of soils in the contaminated areas, the low solubility of DDT in water (approximately 1.2 micrograms per liter), the strong tendency of DDT to adsorb to clay soils, and the limited mobility of particulates in groundwater. Even if traces of DDT were to migrate into the regolith aquifer, further migration downward to and through the underlying limestone bedrock aquifer is not expected because this area is a groundwater discharge area rather than a recharge area.

Monitoring has not shown DDT contamination of groundwater. In 1979, EPA sampled groundwater from public and private water supply wells in the area and found none to be contaminated with DDT or its metabolites. Further, extensive groundwater monitoring conducted for the Army and described in a report prepared by W.A.R., Inc., in 1983 concluded there was no significant contamination of groundwater by DDT at the Redstone Arsenal. Additionally, the results of the Olin Corporation groundwater sampling agree with earlier results. Considering there is no present indication of groundwater contamination by DDT, the properties of DDT, and the hydrogeology of the area, the potential for contamination of groundwater is considered to be remote.

Other

Exhaust emissions from construction equipment and additional vehicular traffic will occur, but their impact will be minimal. Olin will employ fugitive dust control measures as necessary on unpaved roads. Noise is not anticipated to be a problem because no blasting is planned.

A cultural resource survey has indicated that one site, located approximately 30 meters north of HSBM 4.4, may have potential for listing on the National Register of Historic Places. No activities are planned in the vicinity of this area, and no effect is expected on this site.

Land use will be altered by the construction of access roads and the new diversion channel. These changes should not effect the existing land use in the surrounding area other than approved, scheduled effects to Redstone Arsenal activities.

APPENDIX 3

Alternatives to Proposed Remedial Action Plan

This is a summary of alternatives identified by Olin Corporation and the 1980 study by Water and Air Research Inc. (W.A.R) that have been considered by the Review Panel.

Several generic approaches were examined by Olin. They are in-place isolation, low-level dams, removal of contaminated sediments, channel rerouting, biological management, out-of-basin diversion, and destruction. Specific alternatives, including the Olin proposed remedial action, were then developed from these generic approaches. Alternatives were also addressed by the 1980 W.A.R. report.

In-place isolation involves leaving the contaminated sediment in place and using physical means to render it less mobile. Such techniques would include covering the sediment with material such as rip-rap, gravel, clean earthen fill, or geotextile fabrics. These materials, if properly installed, would inhibit the erosional capacity of the stream and thus reduce migration of DDT-contaminated sediment.

There are a number of problems associated with using this method alone. The wetland nature of the site would provide a poor foundation for heavy equipment. The lack of adequate accessibility to many areas could complicate remedial activities. Isolation of the DDT while attempting to maintain a flow in the channel could be difficult. Significant quantities of DDT-laden sediment could be resuspended and carried downstream should isolation be ineffective.

Placement of fill or gravel underwater would be complicated by snags and debris. Addition of substantial material to the channel bottom would reduce cross-sectional area of the channel, thus increasing velocities and altering hydrology. Rip-rap and earthen cover material would have to be sufficient to resist erosional forces during high flows. Efficient placement of this material would be very difficult.

Geotextile fabric overlain by coarse material would also be very difficult to install. Obstructions on the channel bottom would preclude an even cover. There is limited experience in laying this material in deeper water, and divers would likely be required for portions of the work. Long-term stability would be very difficult or impossible to maintain. Materials could shift or the fabric could tear, either of which could release trapped sediment to be transported downstream.

None of the in-place isolation methods alone was deemed sufficient to meet the Consent Decree performance standard.

Low-level dams were considered to reduce transport of sediment and DDT while allowing flow of water in existing channels. This approach would be most effective in controlling the sediment bed load but would have less effect on fine particles. Olin's analysis indicated that bed load transport may be of lesser importance in DDT transport than clay particles. Additionally, constructing dams while maintaining flow during construction would be difficult.

Removal of contaminated sediments from waterways by mechanical dredges, hydraulic dredges, pneumatic dredges, or mechanical techniques such as backhoes, clamshells, or draglines was considered. These techniques could remove contaminated sediments from the stream channel and the overbank areas. There are several concerns with this alternative, including creating DDT contaminated turbidity, locating a place to dispose the contaminated sediment, and the environmental consequences of significantly altering the stream benthos.

Mechanical and hydraulic dredges can result in high generation of turbidity. Without virtual isolation of the areas being dredged by these techniques, significant additional transport of DDT contaminated sediment could occur. Pneumatic dredges are credited with low generation of turbidity, but are inefficient for removal of consolidated sediments such as those that occur in much of Reach A. In many areas, especially uncontaminated locations or isolated areas, mechanical techniques such as a dragline could be appropriate.

Turbidity and associated DDT transport downstream would be produced not only by the actual removal operation but also by snagging and clearing of trees, stumps, and flotsam. A significant amount of clearing would be required because much of the channel bottom is covered with tree debris and stumps.

Channel rerouting would involve isolation of DDT in channel areas by diversion of flow from the natural channel to a new, uncontaminated area. This method isolates the bulk of the DDT from the water flow and thereby eliminates downstream transport and contact by fish. New channels would be constructed to carry the flow from a range of flow conditions. The design of the new channels would have to consider hydrogeology and hydrodynamics, flood conditions, and runoff effects. Dams, dikes, and levees might be necessary to maintain desired flow patterns. Pumping facilities might also be necessary to transfer local runoff.

This alternative would significantly reduce the potential for increased transport downstream of DDT-contaminated sediment. Habitat destruction would occur, and accessibility and stability required for heavy equipment and construction would be difficult.

A biological management alternative involving the placement of fish barriers and periodic removal of fish contaminated with DDT from Reach A of HSB was considered. The primary use of this alternative alone would not significantly reduce the transport of DDT but would remove from the system fish that had been exposed to the highest levels DDT contamination.

Periodical harvesting and disposal of fish and other waterfowl food would reduce uptake of DDT by predatory waterfowl. Concentrations of DDT in fish removed from HSB would be monitored to determine the effectiveness of the overall remedial action taken.

This program has serious drawbacks. Fish barriers are subject to frequent clogging by debris and require frequent maintenance. Smaller mesh sizes, required to stop smaller fish, are more susceptible to clogging. Harvesting methods cannot be expected to remove all fish, because both electroshocking and rotenone poisoning have limited ranges. This approach would do nothing to isolate DDT from the fish. Additionally, this type of management would not control plankton, which would remain free to drift downstream and be consumed by fish and other organisms.

Under the out-of-basin diversion alternative, the HSB would be diverted from above Reach A into an artificial channel directed to the Tennessee River. This approach would eliminate all flow through Reach A other than local runoff. The W.A.R. report presented this technique in some detail and identified significant environmental impacts including alterations and destruction of large areas of habitat and reduction of flow in IC. Because of the adverse environmental impacts, this technique was not further considered.

Techniques are available for destruction of organic contaminants either in place or after removal. In-place biological or chemical destruction, neutralization, and detoxification have been demonstrated in laboratory-scale demonstrations for certain compounds. However, large scale in situ treatment of DDT or related compounds has not been shown feasible.

Off-site treatment of contaminated soils and sediment is possible through several emerging technologies. Neutralization and detoxification, microbial degradation, and incineration are all possible techniques. However, the techniques have not been developed sufficiently to handle and treat the large quantities of material that would be involved in this remedial action. Additionally, large-scale transport of this amount of contaminated material over an extended period would have adverse impacts on local roads and traffic.

Olin then selected two of the generic approaches, channel rerouting and in-place isolation, for development into three site-specific alternatives. The selected alternative, channel isolation with rerouting of HSB, is described in Section II of this document. The remaining two alternatives examined are described below.

Channel rerouting only was considered. This alternative would consist of blocking the existing flow channel in the HSB from HSBM 5.57 to 4.0 with earth-filled dams to prevent flow from entering that designated area. To compensate for this removal, a new channel would be constructed. The new channel would begin at the southwest portion of the Loop and would be excavated through the peninsula immediately north of the levee protecting Test Area 1 (the salient). Flow would pass through the southern embayment area and return to the HSB immediately downstream from HSBM 4.0.

This alternative would reduce, but not eliminate, the downstream transport of contaminanted sediments. The potential for direct exposure and transport would be curtailed during low flows but not during high flows. The existing contaminated area would remain available to wildlife. Thus, while this alternative would address a portion of the problem, this action alone was not considered to be adequate.

In-Place Isolation with Natural Channel Rerouting was also considered. Under this alternative the contaminated channel of the portion of Reach A between HSBM 4.0 and 5.4 would be isolated by diverting flow through the Loop and the existing shallow ponds and marshy areas of the embayment located south of the present channel. Blocking dams would be constructed at HSBM 5.57 and 4.0 and on the Loop.

The existing channel, after isolation, would then be filled with clean material that would be imported to the site. No new channel would be constructed; instead, the HSB would be allowed to find its own new course. This would avoid the environmental impacts associated with new channel construction. However, the flow could cut back into the isolated channel segment. The contaminated sediment could then be transported downstream. This alternative was determined to be insufficient.

The W.A.R. Report discussed several of the previously described approaches plus some additional alternatives. The approaches considered were natural restoration, dredging and disposal, out-of-basin diversion and removal of contaminated sediments, out-of-basin diversion and containment of contaminated sediments, within-basin diversion and removal of contaminated sediments, and within-basin diversion and containment of contaminated sediments.

Under a natural restoration alternative, isolation of DDT contamination would be left to natural processes. For the existing situation to improve, one of three things would be required: (1) the DDT would have to be degraded to a harmless compound; (2) the DDT would have to become isolated in some manner from the rest of the environment; or (3) the DDT would have to be flushed from the system.

Because of the known persistence of DDT, especially at the high concentrations found in HSB, the natural degradation rate would be very slow. The estimated half-life is on the order of 20-30 years. Under the most optimistic assumptions, DDT could be expected to remain in the system for a long time.

The most likely method of the material becoming naturally isolated from the environment would be burial by natural sedimentation. While the former DDT plant has been closed for over ten years, a substantial amount of DDT is still close to the surface. Thus, natural restoration does not appear to be proceeding at a very rapid rate.

Given the mass of DDT in the system and the current estimates of transport rates, it appears that hundreds of years would be required to flush the system naturally. The negative impacts to the Tennessee River would far outweigh any gains from this approach.

A specific dredging and disposal alternative was developed. The HSB and IC channel sediments would be dredged hydraulically to a depth of 3 feet. The overbank area would be dredged by dragline to a depth of 3 feet. Hydraulically dredged sediments would be pumped to a disposal area, where they would be dewatered. Dragline-dredged sediments would be hauled by truck to the disposal area.

This alternative could result in suspension and redistribution of DDT downstream in HSB-IC. During operations, the contamination of fish and wildlife with DDT could be significantly increased. This action could actually increase contamination of fish caught in lower portions of IC and the Tennessee River.

This alternative would require extensive destruction and alteration of wetland habitat. Fish would be likely to move to avoid dredging. Once dredging were completed and fish returned, there would be a decrease in available food supply for several years. The food available upon their return could be expected to be contaminated with residual DDT, although ultimately at lower concentrations.

During the dredging and dewatering phase, wildlife would be exposed to the disposal area until its closure. Water quality would be somewhat degraded by turbidity, increased suspension and redistribution of DDT, and increased solid loadings as a result of erosion.

Out-of-basin diversion and removal of contaminated sediments was addressed in the 1980 W.A.R. Report. The HSB would be diverted from 3 miles upstream of the highly contaminated area directly to the Tennessee River. Channel sediments between HSBM 2.4 and ICM 0.0 would be hydraulically dredged under near-zero flow conditions. The channel between HSBM 2.4 and 5.6 may be hydraulically dredged or dredged with a dragline if the area were dewatered by construction of a containment dike. Overbank sediments would be dredged by dragline.

This alternative would require considerable destruction or alteration of habitat. Excavation of the diversion channel would be expected to meet bedrock in at least two areas. Flow in IC would be reduced by more than one half, but water levels would not change significantly because they are controlled by Wheeler Reservoir.

Out-of-basin diversion and containment of contaminated sediments is an additional alternative addressed in the W.A.R. Report. The HSB would be diverted from 3 miles upstream of the highly contaminated area directly to the Tennessee River. Channel sediments between HSBM 2.4 and ICM 0.0 would be dredged hydraulically. A containment dike would be constructed. Channel and overbank sediments within the containment area would be covered with compacted clay and clean fill.

Impacts from construction of the diversion channel would be the same as described above. The area to be isolated for containment is largely a wetland system. The areas surrounding that to be filled or covered could be expected to become drier, with associated shifts in species. Lower spots within the area would likely become pools on ponds. The existing contaminated wetland system would become a noncontaminated upland. This alternative would also require significant destruction or alteration of habitat.

Within-basin diversion and removal of contaminated sediments was considered. The HSB would be diverted around the highly contaminated channel between HSBM 3.9 and 5.6. A containment dike would be constructed. HSB and IC channel sediments downstream from the containment area would be dredged hydraulically under near-zero flow conditions, or dredged by dragline if the containment area were dewatered. Overbank sediments would be dredged by dragline.

Dredging would increase turbidity levels and, without careful controls, could significantly increase the distribution downstream of DDT contaminated sediment. A within basin diversion channel would require destruction of significantly less habitat than an out-of-basin diversion.

Another alternative discussed is within-basin diversion and containment of contaminated sediments. HSB would be diverted around the highly contaminated channel between HSBM 3.9 and 5.6. A containment dike would be constructed. HSB and IC channel sediments downstream from the containment area would be dredged hydraulically. Channel and overbank sediments within the containment area would be covered with compacted clay and clean fill. This alternative included an option for constructing, within the containment area, a disposal area for sediments dredged downstream from HSBM 3.9. The impacts of this alternative have been discussed under the removal of contaminated sediments, channel rerouting, and dredging and disposal alternatives. In addition, construction of a permanent disposal area and a longer diversion channel would cause increased loss and alteration of wetlands.

APPENDIX 4

Public Comments and Responses

On July 14, 1984, after 30 days advance notice to the public through local newspaper advertisements, a public hearing was held in the Town of Triana, Alabama, to provide information to the public and receive comments on the Olin Corporation remedial plan. More than four hundred people attended the July 14 public hearing, twenty people registered to speak and eleven actually made statements.

The hearing record was kept open until July 28, 1984, to receive written comments. In addition to the oral comments entered into the record at the July 14, 1984, hearing, seventeen written comments were received by July 28, 1984, and nine were received after that date. All comments, oral and written, have been made part of the public record and have been considered by the Review Panel in its deliberations on the Olin Corporation remedial proposal.

Those comments pertaining specifically to the remedial proposal may be generally classified into three categories: supporting the plan, supporting the plan with modifications, and recommending alternative remedies. The majority of the commenting citizens from the immediate area of the contamination supported the Olin Corporation's proposed remedial plan. They urged the Review Panel to approve the plan and the Olin Corporation to complete the proposed isolation of the DDT as rapidly as possible.

Several people had specific concerns. These concerns dealt with the long term monitoring program, a lack of specificity in the plan, the varying amounts of DDT reported in HSB-IC, the scope of the Olin Corporation remedial action plan, the potential for groundwater contamination, the groundwater monitoring program, the permanency of the isolation of the DDT, and the appropriateness of alternative remedial actions.

Some of the comments made at the public hearing and by mail addressed matters outside the scope of the public hearing and the Review Panel's deliberations on the remedial plan and are therefore not appropriate subjects for consideration by the Review Panel. Comments relating directly to Olin's remedial proposal are addressed below.

The long-term monitoring program will be further defined and resubmitted to the Review Panel on February 1, 1985. The minimum types of samples and the sampling and analytical protocols were set forth in the Joint Technical Proposal to Implement Remedial Activities developed pursuant to the Consent Decree. Comments concerning the statistical analyses to be used to verify reduction of DDT in fish, the adequacy and availability of selected species, sampling periods, and quality assurance will be carefully considered by the Review Panel in its deliberations on the final monitoring plan. Additionally, laboratory studies addressing sediment and diet uptake, the instream cage study, and the fish sampling program will continue, and time-of-travel studies and a water sampling program will be instituted.

Comments concerning a lack of detailed information will be addressed upon submittal by Olin of the preliminary detailed engineering design work on April 1, 1985. The Review Panel has review and approval authority for this engineering design. The Review Panel will take the comments received during this comment period into consideration during its review of and subsequent action on the detailed design.

Several commenters noted the range of numbers reporting the amount of DDT in the HSB-IC system. The figure of 4,000 tons was the result of a preliminary assessment conducted by TVA in 1978. This assessment was used to determine the need for further study. A more detailed engineering study conducted by W.A.R., Inc., 1980, subsequently reported a total of 837 tons in the HSB-IC system. Following the discovery of a mathematical error in calculations, this figure was revised by W.A.R., Inc., to 475 tons. This amount is close to Olin's investigatory results of 422 tons.

Concerns expressed regarding the scope of Olin's remedial action plan as submitted have been considered by the Review Panel. In-house reviews have also been performed by the various agencies involved. These concerns and reviews have resulted in additional discussions and modifications to the proposal as set forth in the August 13, 1984, letter from the Olin Corporation (Appendix 1) and the Review Panel decision. The modifications include isolation of DDT in the overbank area, expansion of the amount of DDT to be isolated or removed in Reach A, and further identification of the extent of DDT contamination in Reaches B and C.

Potential groundwater contamination was a concern of several commenters. This issue has been carefully evaluated. The potential for subsurface migration of DDT either laterally or vertically is extremely low because of the low permeability of soils in the contaminated areas, the low solubility of DDT in water (approximately 1.2 micrograms per liter), the strong tendency of DDT to adsorb to clay soils, and the limited mobility of particulates in groundwater. Even if traces of DDT were to migrate into the regolith aquifer, further migration downward to and through the underlying limestone bedrock aquifer would not be expected because this area is a groundwater discharge area rather than a recharge area.

Monitoring has not shown DDT contamination of groundwater. In 1979, EPA sampled groundwater from public and private water supply wells in the area and found none to be contaminated with DDT or its metabolites. Further, extensive groundwater monitoring conducted for the Army and described in a report prepared by W.A.R., Inc., in 1983 concluded there was no significant contamination of groundwater by DDT at Redstone Arsenal. Additionally, the results of the Olin Corporation sampling agree with earlier results. Considering there is no present indication of groundwater contamination by DDT, the properties of DDT, and the hydrogeology of the area, the potential for contamination of groundwater is considered to be remote.

Several questions were raised regarding the groundwater monitoring program and the adequacy of the baseline. The groundwater wells that have been sampled by the Olin Corporation as part of its compliance with the terms of the Consent Decree are wells that were previously installed on Redstone Arsenal for the purpose of detecting any DDT contamination of groundwater that might exist. Olin was required by the terms of the Consent Decree to sample specified groundwater wells in 1983 to establish a baseline for purposes of measuring the results of the remedial action. In addition, groundwater sampling is to be performed by Olin once every two years for up to ten years or until three consecutive samples indicate no contamination.

The wells specified for monitoring in the Consent Decree were selected from the existing wells at Redstone Arsenal. They represent sampling points upgradient from the old outflow ditch and downgradient from where the ditch crossed the former plant site. The public water supply wells specified are located off Redstone Arsenal property on the north, east, and west sides. There are no active public water supply wells to the south between the Arsenal and the Tennessee River.

The comments that addressed sampling frequency, the location of monitoring wells, and the need for unfiltered samples will be considered by the Review Panel in its review of the final long-term monitoring plan, to be submitted by Olin on February 1, 1985.

Some commenters raised concerns regarding the permanency of isolation of DDT contaminated sediment with regard to possible erosion, scouring and/or flooding. DDT has a low solubility in water, and any significant transport of DDT out of the area would primarily occur from transport of contaminated sediment. Soils underlying the area are predominantly clays, to which DDT strongly adsorbs. The covering of contaminated sediments, subsequent revegetation, the diversion of the former wastewater ditch, and the construction of the rainfall diversion ditch should minimize this possibility. All dams, the area isolated, and the channel stabilization will be designed to withstand repeated flooding and erosion.

No significant erosion or scouring of contaminated sediment from the area isolated is expected. Once contaminated sediments are covered with clean fill material and stabilized, the area isolated will have an elevation similar to the overbank area. Historically, the overbank area has not been subject to significant scouring, but rather has been a depositional area. The area isolated also is expected to be a depositional area after completion of the remedial action.

No significant modification of flow is expected to occur from the implementation of the plan that would be expected to alter the frequency of flooding or the potential for scouring. Most flooding events are caused by backwater from Wheeler Reservoir. The new diversion channel will be designed to carry a greater volume of flows than the existing channel and will not cause additional flooding. Further, the removal of the Huntsville wastewater treatment plant effluent will reduce flows in the HSB system by an estimated 30 million gallons per day. These features of the area and the remedial plan indicate that permanent isolation should occur, with minimal scouring and resuspension of DDT-contaminated sediment from the area isolated.

Recommendations for several alternative remedial actions were received as comments, and are discussed below.

1. Dredge and Transport Offsite - This alternative was considered in the W.A.R. Report, 1980. Dredging would result in a significant opportunity for suspension and redistribution of DDT further into the HSB-IC system and into the Tennessee River. During the operations, the contamination of fish and wildlife with DDT could be significantly increased. The added transport could result in higher levels of contamination occurring in downstream areas. This action could increase the contamination of fish in the lower portions of IC and the Tennessee River.

This alternative would involve destruction of the major portion of the existing natural habitat of HSB and much of IC. Aquatic habitats and wetlands covering hundreds of acres would be destroyed or drastically altered. Depending on the alternative chosen, almost 72 acres of stream bank would be converted to access roads, over 12 miles of pipelines with 11 booster pumps would be installed for transporting dredged material, 187 acres of upland habitat would be converted into disposal areas, and a two to three million gallon per day (MGD) water treatment plant and/or a four million gallon per day pumping station would have to be constructed. In all, an estimated 1000 acres of upland and aquatic habitat would be significantly altered.

Following dredging, the material would have to be transported from the site. Transportation of the DDT-contaminated sediments to a licensed hazardous waste landfill would be difficult. The nearest permitted hazardous waste landfill is located at Emelle, in west Alabama, approximately 170 miles away. Local roads and traffic would be adversely affected by the truck traffic necessary to move this amount of material. A large number of specialized trucks would be required. Transport of this material could require as much as five years to accomplish. Prior to hauling, the sediment would require dewatering, which would create an added problem of disposing of the contaminated water and would increase the risk of DDT being released to the environment.

The adverse effects from this remedy, including the potential for redistribution of the DDT into the environment from dredging and transportation, the other severe environmental consequences of dredging, the effect on local roads and traffic, and the questionable additional benefits that might be obtained indicate this alternative is not in the public interest.

3. Destroy Fish and Restock - This method, to be successful, would involve killing fish - not only resident in the HSB-IC System, but also fish resident in the Wheeler Reservoir - because fish migrate from Wheeler Reservoir into HSB-IC and can become contaminated. Methods for accomplishing this approach would be detrimental to the entire system, because the effect could not be limited to fish. Collection and disposal of the contaminated fish would be a considerable problem. Since the typical lifespan of the

fish in this area is approximately ten years, this action could eliminate some of the contaminated fish from HSB-IC faster than normal mortality. However, the benefits to be gained from this approach are not deemed to justify the severe environmental consequences.

4. On-Site or Off-Site Detoxification - In-place biological or chemical destruction, neutralization, and detoxification, have been demonstrated in laboratories but have not yet been proven feasible for large scale treatment. In addition, research performed in the 1970s on incineration of DDT found the method to be feasible for small amounts of material but not manageable for large amounts. Any of these methods would require dewatering the material prior to on-site or off-site treatment. Dewatering would create an added disposal problem and increase the risk of releasing DDT back into the environment. For off-site treatment the material would have to be hauled by truck, with the added risks and environmental consequences inherent in the transport of large quantities of contaminated sediment.

5. Wetlands Mitigation - Mitigation for the loss of wetlands is an alternative that will be considered through the various federal and state permitting processes.

APPENDIX 5

Flood Easement Considerations

TVA has no custody or control of lands within Redstone Arsenal, thus, the proposal as modified would not require any TVA land use authorization. However, TVA has flood easement rights up to elevation 560. The Olin proposal as modified does not appear to have any major effect on TVA reservoir flood storage capacity; however, some compensation may be required for losses of power storage capacity between elevations 550 and 556.3. TVA cannot make any guarantees with respect to water levels in the project area, nor can the water levels resulting from normal reservoir operations be changed except in special circumstances. These circumstances would have to be fully evaluated in advance by TVA and may require compensation for any alterations.

APPENDIX 6

U. S. Fish and Wildlife Service Considerations

The U. S. Fish and Wildlife Service plans to conduct a wildlife monitoring program on Wheeler National Wildlife Refuge to determine residues of DDT in various species of wildlife. The data obtained from this program will be submitted to the Review Panel.

APPENDIX F

FUTURE KEY DATES

FUTURE KEY DATES

August 1986	Oral presentation of Olin's plan for Lower Reach A.
October 1986	Submission of Olin's plan for Lower Reach A.
July-December 1986	Review Panel decision on: 1. Interim goals for DDT levels in water and fish 2. Substitute fish species 3. Long-term monitoring programs. 4. Baseline data report for DDT in water and fish
October 1986- June 1987	Review Panel decision on Olin plan for Lower Reach A.
August 1987	Completion of construction for Remedial Action in Upper Reach A.
February 1990	Olin submittal of monitoring results for first two years following completion of remedial action in Upper Reach A.
Future Dates (to be determined)	Within ten years from the date of completion of construction and implementation of the initial remedial action, Olin shall attain the performance standard. Attainment of the performance standard in each reach and for each performance standard fish species will be determined by the Review Panel following the review of the results of each annual monitoring period.